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No. 2

NAVAL AND MERCHANT SHIP CONSTRUCTION.

Since the 1901 ship building edition of the Marine Review the battleships Illinois, built by the Newport News Co., Newport News, Va., and the Wisconsin, built by the Union Iron Works, San Francisco, Cal., have gone into commission. The torpedo craft Bagley, Barney and Biddle, built by the Bath Iron Works, Bath, Me., the Bailey built by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y., and the Shubrick and Stockton, built by the William R. Trigg Co., Richmond, Va., have been completed and accepted by the navy department. With these exceptions the naval program under construction is the same as it was a year ago though, of course, material progress has been made on all the ships. No new contracts were made during the year. Altogether there are fifty-one warships under construction for the United States navy with a total displacement of 264,987 tons, a total horse power of 523,420 and costing for hulls and machinery \$74,731,666.

All of the coast ship builders are busy and have received several important contracts during the year. It is to be noted, however, that the contracts are by no means as important as those of the preceding year and upon which, indeed, the ship yards are still working. Had the leading coast ship yards received no new orders whatever during the year they would still have sufficient work on hand to keep them busy for some time to come. The greater part of this coast activity is in vessels for the coastwise trade. In point of fact it may be said that all the new contracts are for the coastwise trade. No new orders have been placed for vessels for the foreign trade of the United States. The Maryland Steel Co., Sparrow's Point, Md., is building two vessels for the Boston Steamship Co. for foreign service and two for the Atlantic Transport Co. The New York Ship Building Co., Camden, N. J., is building four vessels for the foreign service of the Atlantic Transport Co., but all these orders were noted in the last ship building edition of the Review. The novelty last year was the construction of two six-masted wooden schooners. The novelty this year is a seven-masted steel schooner, the first to be constructed anywhere in the world. This giant schooner is building at the works of the Fore River Ship & Engine Co., Quincy, Mass.

The ship builders of the great lakes have never experienced a season of activity like the present one. Unlike the coast ship yards where new contracts have been in a comparative sense scarce, the lake yards are fairly crowded with new work—so much so that months ago the American Ship Building Co. (consolidated lake yards) could not take an order for delivery at the opening of the coming season of navigation. The table on the opposite page tells the story of this wonderful activity.

VESSELS UNDER CONSTRUCTION FOR THE UNITED STATES NAVY.

Name of vessel.	Where and by whom building.	Probable date of completion.	Dimensions.			Displacement tons.	Indicated horse power.	Contract speed, knots.	Type of engine.	Type of boilers.	Contract price exclusive of armor and armament.	
			L'th L. W. L.	Beam.	Mean dra'ght							
Battleships.												
Maine	Cramp & Sons, Philadelphia.....	June, 1901.	388	72.2	23.6	12,300	16,000	18	Twin-screw, vertical, triple expansion.	24 Niclausse	\$2,885,000	
Missouri	Newport News Works, Virginia.....	Feb., 1902.	388	72.2	23.6	12,230	16,000	18	Twin-screw, vertical, triple expansion.	12 Thornycroft	2,885,000	
Ohio	Union Iron Works, San Francisco.....	Mar., 1902.	388	72.2	23.6	12,440	16,000	18	Twin-screw, vertical, triple expansion.	12 Thornycroft	2,899,000	
Nebraska	Moran Bros. Co., Seattle.....	June, 1904.	435	76.10	24	15,320	19,000	19	Twin-screw, vertical, triple expansion.	24 Babcock & Wilcox	3,723,600	
Virginia	Newport News Works, Virginia.....	June, 1904.	435	76.10	24	15,320	19,000	19	Twin-screw, vertical, triple expansion.	24 Babcock & Wilcox	3,590,000	
Georgia	Bath Iron Works, Bath, Me.....	June, 1904.	435	76.10	24	15,320	19,000	19	Twin-screw, vertical, triple expansion.	24 Babcock & Wilcox	3,590,000	
New Jersey	Fore River Engine Co., Quincy, Mass..	June, 1904.	435	76.2	24	14,600	19,000	19	Twin-screw, vertical, triple expansion.	24 Babcock & Wilcox	3,405,000	
Rhode Island	Fore River Engine Co., Quincy, Mass..	June, 1904.	435	76.2	24	14,600	19,600	19	Twin-screw, vertical, triple expansion.	24 Babcock & Wilcox	3,405,000	
Armored Cruisers												
Pennsylvania	Cramp & Sons, Philadelphia.....	June, 1904.	502	70	24.6	13,800	23,000	22	Twin-screw, vertical, triple expansion.	30 water tube	3,890,000	
Colorado	Cramp & Sons, Philadelphia.....	June, 1904.	502	69.6	24.6	13,400	23,000	22	Twin-screw, vertical, triple expansion.	30 water tube	3,730,000	
California	Union Iron Works, San Francisco.....	June, 1904.	502	70	24.6	13,800	23,000	22	Twin-screw, vertical, triple expansion.	30 water tube	3,800,000	
South Dakota	Union Iron Works, San Francisco.....	June, 1904.	502	69.6	24.6	13,400	23,000	22	Twin-screw, vertical, triple expansion.	30 water tube	3,750,000	
West Virginia	Newport News Works, Virginia.....	June, 1904.	502	70	24.6	13,800	23,000	22	Twin-screw, vertical, triple expansion.	30 water tube	3,885,000	
Maryland	Newport News Works, Virginia.....	June, 1904.	502	69.6	24.6	13,400	23,000	22	Twin-screw, vertical, triple expansion.	30 water tube	3,775,000	
Protected Cruisers.												
St. Louis	Neafie & Levy, Philadelphia.....	June, 1904.	424	66	23.6	10,000	21,000	22	Twin-screw, vertical, triple expansion.	16 water tube	2,740,000	
Milwaukee	Bath Iron Works, Bath, Me.....	June, 1904.	424	66	23.6	10,000	21,000	22	Twin-screw, vertical, triple expansion.	16 water tube	2,750,000	
Charleston	Newport News Works, Virginia.....	June, 1904.	424	66	23.6	10,000	21,000	22	Twin-screw, vertical, triple expansion.	16 water tube	2,741,000	
Monitors.												
Arkansas	Newport News Works, Virginia.....	Sept., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion.	4 Thornycroft	960,000	
Connecticut	Bath Iron Works, Bath, Me.....	Mar., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion.	4 Niclausse	962,000	
Florida	Lewis Nixon, Elizabeth, N. J.....	Apr., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion.	4 Mosher	925,000	
Wyoming	Union Iron Works, San Francisco.....	Mar., 1901.	252	50	12.6	3,235	2,400	11.5	Twin-screw, vertical, triple expansion.	4 Babcock & Wilcox.	975,000	
2d Class Cruisers.												
Denver	Neafie & Levy, Philadelphia.....	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube	1,080,000	
Galveston	Wm. R. Trigg Co., Richmond.....	Jan., 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube	1,027,000	
Chattanooga	Lewis Nixon, Elizabeth, N. J.....	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube	1,039,966	
Cleveland	Bath Iron Works, Bath, Me.....	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube	1,041,650	
Tacoma	Union Iron Works, San Francisco.....	Apr., 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube	1,041,900	
Des Moines	Fore River Engine Co., Quincy, Mass..	July, 1902.	292	44	15.9	3,200	4,700	16.5	Twin-screw, vertical, triple expansion.	6 water tube	1,065,000	
Torpedo Craft.												
Bainbridge	Neafie & Levy, Philadelphia.....	June, 1901.	245	23.7	6.6	420	8,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft	283,000	
Barry	Neafie & Levy, Philadelphia.....	June, 1901.	245	23.7	6.6	420	8,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft	283,000	
Chauncey	Neafie & Levy, Philadelphia.....	June, 1901.	245	23.7	6.6	420	8,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft	283,000	
Date	Wm. R. Trigg Co., Richmond.....	May, 1901.	245	23.7	6.6	420	8,000	28	Twin-screw, vertical, triple expansion.	4 Thornycroft	260,000	
Decatur	Wm. R. Trigg Co., Richmond.....	Dec., 1900.	245	23.7	6.6	420	8,000	28	Twin-screw, vertical, triple expansion.	4 Thornycroft	260,000	
Hopkins	Harlan & Hollingsworth, Wilmington.	Apr., 1901.	244	24.6	6.0	408	7,200	29	Twin-screw, vertical, triple expansion.	4 Thornycroft	291,000	
Hull	Harlan & Hollingsworth, Wilmington.	Apr., 1901.	244	24.6	6.0	408	7,200	29	Twin-screw, vertical, triple expansion.	4 Thornycroft	291,000	
Lawrence	Fore River Engine Co., Quincy, Mass..	Dec., 1900.	242	22.3	6.2	400	8,400	30	Twin-screw, vertical, triple expansion.	4 water tube	281,000	
Macdonough	Fore River Engine Co., Quincy, Mass..	Dec., 1900.	242	22.3	6.2	400	8,400	30	Twin-screw, vertical, triple expansion.	4 water tube	281,000	
Paul Jones	Union Iron Works, San Francisco.....	Jan., 1901.	245	23.7	6.6	420	7,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft	285,000	
Perry	Union Iron Works, San Francisco.....	Jan., 1901.	245	23.7	6.6	420	7,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft	285,000	
Preble	Union Iron Works, San Francisco.....	Jan., 1901.	245	23.7	6.6	420	7,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft	285,000	
Stewart	Gas Engine & Power Co., New York...	Mar., 1901.	245	23.7	6.6	420	8,000	29	Twin-screw, vertical, triple expansion.	4 Thornycroft	282,000	
Truxton	Maryland Steel Co., Sparrows Point...	Mar., 1901.	248	23.3	6.0	433	8,300	30	Twin-screw, vertical, triple expansion.	4 Normand	286,000	
Whipple	Maryland Steel Co., Sparrows Point...	Mar., 1901.	248	23.3	6.0	433	8,300	30	Twin-screw, vertical, triple expansion.	4 Normand	286,000	
Worden	Maryland Steel Co., Sparrows Point...	Mar., 1901.	248	23.3	6.0	433	8,300	30	Twin-screw, vertical, triple expansion.	4 Normand	286,000	
Goldsborough	Wolf & Zwicker, Portland, Ore.....	Dec., 1900.	196	20.5	5.0	247	6,090	30	Twin-screw, vertical, triple expansion.	3 Thornycroft	214,000	
Stringham	Harlan & Hollingsworth, Wilmington.	Dec., 1900.	225	22.0	6.6	340	7,200	30	Twin-screw, vertical, triple expansion.	4 Thornycroft	236,000	
Blakely	Geo. Lawley & Sons, S. Boston.....	Jan., 1901.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, triple expansion.	3 Normand	159,400	
Delong	Geo. Lawley & Sons, S. Boston.....	Jan., 1901.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, triple expansion.	3 Normand	159,400	
Nicholson	Lewis Nixon, Elizabeth, N. J.....	Jan., 1901.	175	17.0	4.6	174	3,000	26	Twin-screw, vertical, triple expansion.	3 water tube	165,000	
O'Brien	Lewis Nixon, Elizabeth, N. J.....	Jan., 1901.	175	17.0	4.6	174	3,000	26	Twin-screw, vertical, triple expansion.	3 water tube	165,000	
Thornton	Wm. R. Trigg Co., Richmond.....	Jan., 1901.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, triple expansion.	3 Thornycroft	129,750	
Tingey	Columbian Iron Works, Baltimore...	Jan., 1901.	175	17.6	4.8	165	3,000	26	Twin-screw, vertical, triple expansion.	3 Thornycroft	168,000	
Wilkes	Gas Engine & Power Co., New York...	Mar., 1901.	175	17.6	4.8	165	3,000	26.5	Twin-screw, vertical, triple expansion.	3 Seabury	146,000	
Submarine Boats.												
Plunger	Wm. R. Trigg Co., Richmond.....	Not set.....	85.3	11.6	....	168	.....	.....	Single-screw, Otto gas engine.	.....	150,000
Adder	Lewis Nixon, Elizabeth, N. J.....	Apr., 1901.	63.4	11.9	....	120	160	8	Single-screw, 4-cylinder Otto gasoline.	Gasoline tank	170,000
Grampus	Union Iron Works, San Francisco.....	Apr., 1901.	63.4	11.9	....	120	160	8	Single-screw, 4-cylinder Otto gasoline.	Gasoline tank	170,000
Holland	Lewis Nixon, Elizabeth, N. J.....	Apr., 1901.	53.11	10.3	....	74	45	8	Single-screw Otto gasoline.....	Gasoline tank	150,000
Mocassin	Lewis Nixon, Elizabeth, N. J.....	May, 1901.	63.4	11.9	....	120	160	8	Single-screw, 4-cylinder Otto gasoline.	Gasoline tank	170,000
Pike	Union Iron Works, San Francisco.....	May, 1901.	63.4	11.9	....	120	160	8	Single-screw, 4-cylinder Otto gasoline.	Gasoline tank	170,000
Porpoise	Lewis Nixon, Elizabeth, N. J.....	June, 1901.	63.4	11.9	....	120	160	8	Single-screw, 4-cylinder Otto gasoline.	Gasoline tank	170,000
Shark	Lewis Nixon, Elizabeth, N. J.....	July, 1901.	63.4	11.9	....	120	160	8	Single-screw, 4-cylinder Otto gasoline.	Gasoline tank	170,000
						264,987	523,420					\$74,731,666

STEEL SHIPS FOR THE LAKES VALUED AT \$10,273,000

The value of forty-three steel vessels building or under order in lake ship yards for delivery during the present year is \$10,273,000. All but five of these vessels are freighters, most of them of the 5,000 and 6,000-ton type. The combined capacity of the freighters on 18 ft. draught for a single trip is 179,800 gross tons, so that in a full season of navigation they would move about 3,500,000 gross tons of freight, but of course not all of them are to be completed in time for operation during the full season of 1902. Only two of the freight carriers are tow barges and none of the steamers are of the 7,000 or 8,000-ton kind that were built in 1900. This means that the steamer of 5,000 to 6,000 gross tons capacity (the former probably preferred) is now looked upon as the "handy" vessel in the ore, coal and grain trades. The few tow barges in the list is also significant. Most lake vessel owners are now of the opinion that experience with big steel tows during four or five years past does not warrant a continuance of that method of operating ships as against the "lone steamer."

Thirty-four of the forty-three vessels in the list are building at the several yards of the American Ship Building Co. No wooden vessels are included in the summary, as James Davidson of West Bay City, Mich., is now alone in this industry on the lakes. He is putting down two wooden tow barges that will each be of about 5,000 tons capacity and \$100,000 value. These vessels will be 350 ft. long, 46 ft. beam and 26 ft. depth of hold. Two large steel freighters, building at the Cleveland works of the American Ship Building Co. for salt-water service, are also omitted from the list, as they were begun about a year ago and were included in last year's summary. These vessels are to be finished during the winter and taken to the seaboard (each in two parts) as soon as the St. Lawrence canals are opened next spring. Their capacity with deep ocean draught will be about 7,000 tons. A large steel passenger steamer for the Northwest Transportation Co. of Sarnia, nearing completion at the works of the Collingwood Ship Building Co., Collingwood, Ont., is also omitted on account of having been included in last year's summary.

Particulars of forty-three Steel Vessels under construction in Great Lakes Ship Yards, for delivery in 1902.

SHIPS BUILDING AT THE SEVERAL WORKS OF THE AMERICAN SHIP BUILDING CO.

To be built in	Type.	Dimensions in feet.				Dimensions of engines. All triple expansion.	Boilers—dimensions in ft. and in.	Draft.	Steam pressure, lbs.	Capacity, gross tons, 18 ft. draught.	Value.	For whom building.
		Over all.	Keel.	Beam.	Depth.							
Cleveland	Cargo stmr.	436	416	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Ellis & Eaves.	170	6,200	\$260,000	John Mitchell, et. al., Cleveland.
Cleveland	Cargo stmr.	436	416	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Ellis & Eaves.	170	6,200	260,000	John Mitchell, et. al., Cleveland.
Lorain	Cargo stmr.	436	416	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Ellis & Eaves.	170	6,200	280,000	John Mitchell, et. al., Cleveland.
Lorain	Cargo stmr.	436	416	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Ellis & Eaves.	170	6,200	280,000	John Mitchell, et. al., Cleveland.
Lorain	Cargo stmr.	400	380	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Howden	170	5,600	240,000	J. C. Gilchrist, Cleveland.
Lorain	Cargo stmr.	400	380	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Howden	170	5,600	240,000	J. C. Gilchrist, Cleveland.
Lorain	Cargo stmr.	400	380	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Howden	170	5,600	240,000	J. C. Gilchrist, Cleveland.
Lorain	Cargo stmr.	400	380	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Howden	170	5,600	240,000	J. C. Gilchrist, Cleveland.
Lorain	Cargo stmr.	400	380	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Howden	170	5,600	240,000	J. C. Gilchrist, Cleveland.
Lorain	Cargo stmr.	400	380	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Howden	170	5,600	240,000	J. C. Gilchrist, Cleveland.
Buffalo	Cargo stmr.	400	380	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Howden	170	5,600	245,000	W. W. Brown syndicate, Cleveland.
Bay City	Cargo stmr.	434	414	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Ellis & Eaves.	170	6,200	260,000	W. W. Brown syndicate, Cleveland.
Chicago	Cargo stmr.	390	370	48	28	20, 33½, 55x40.	Two Scotch, 12-10x13.	Natural	170	5,250	230,000	W. W. Brown syndicate, Cleveland.
Chicago	Cargo stmr.	366	346	48	28	20, 33½, 55x40.	Two Scotch, 12-10x13.	Natural	170	4,800	220,000	W. W. Brown syndicate, Cleveland.
Chicago	Cargo stmr.	366	346	48	28	20, 33½, 55x40.	Two Scotch, 12-10x13.	Natural	170	4,800	220,000	W. W. Brown syndicate, Cleveland.
Chicago	Cargo stmr.	366	346	48	28	20, 33½, 55x40.	Two Scotch, 12-10x13.	Natural	170	4,800	220,000	E. D. Carter, Erie, Pa.
Chicago	Cargo stmr.	366	346	48	28	20, 33½, 55x40.	Two Scotch, 12-10x13.	Natural	170	4,800	230,000	E. D. Carter, Erie, Pa.
Cleveland	Cargo stmr.	374	354	48	28	20, 33½, 55x40.	Two Scotch, 12-10x13.	Natural	170	4,900	220,000	W. C. Richardson, Cleveland.
Superior	Cargo stmr.	366	346	48	28	20, 33½, 55x40.	Two Scotch, 12-10x13.	Natural	170	4,800	220,000	G. A. Tomlinson, Duluth.
Superior	Cargo stmr.	366	346	48	28	20, 33½, 55x40.	Two Scotch, 12-10x13.	Natural	170	4,800	220,000	G. A. Tomlinson, Duluth.
Detroit	Cargo stmr.	366	346	48	28	22, 35, 58x42.	Two Scotch, 13-2x11-6.	Howden	170	4,800	230,000	Franklin Transportation Co., Cleve'd.
Buffalo	Barge	380	366	44	26	23, 38, 64x40.	Three Scotch, 12x11-6.	Howden	180	5,350	185,000	Franklin Transportation Co., Cleve'd.
Chicago	Package frt.	345	325	44	28	23, 38, 64x40.	Three Scotch, 12x11-6.	Howden	180	4,100	280,000	Western Transit Co., Buffalo.
Superior	Cargo stmr.	366	346	48	28	20, 33½, 55x40.	Two Scotch, 12-10x13.	Natural	170	4,800	220,000	F. Selther, Cleveland.
Lorain	Cargo stmr.	434	414	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Ellis & Eaves.	170	6,200	260,000	Arthur Hawgood and others, Cleve'd.
Bay City	Cargo stmr.	434	414	50	28	22, 35, 58x42.	Two Scotch, 13-2x11-6.	Ellis & Eaves.	170	6,200	260,000	H. A. Hawgood and others, Cleve'd.
Bay City	Cargo stmr.	434	414	50	28	22, 35, 58x42.	Two Scotch, 13-2x11-6.	Ellis & Eaves.	170	6,200	260,000	W. A. Hawgood and others, Cleve'd.
Lorain	Cargo stmr.	400	380	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6.	Howden	170	5,600	260,000	W. A. Hawgood and others, Cleve'd.
Superior	Cargo stmr.	376	356	50	27	17, 31, 55x40.	Two Babcock & Wilcox.	Natural	250	5,000	260,000	Provident S. S. Co. (A. B. Wolvin).
Bay City	Cargo stmr.	376	356	50	28	20, 33½, 55x42.	Two Scotch, 14x12.	Natural	170	5,000	245,000	A. E. Stewart, Detroit.
Cleveland	Car ferry	350	338	56	19½	22½, 36, 59x36 (2)	Six Scotch, 13x12.	Natural	175	.....	400,000	Pere Marquette Ry. Co.
Detroit	Stmr. (Greyhound)	285	276	38	15	Old, beam type	Three old boilers.	Natural	60	.....	275,000	White Star Line, Detroit.
Detroit	Ferry stmr.	.....	.....	.....	.....	Dimensions, sizes of engines, etc., not yet fixed—	.....	.....	.....	.....	150,000	Detroit, Belle Isle & Windsor Co.
Detroit	Pass. and frt. stmr.	366	350	55	19-6	.....	Eight Scotch	.....	.....	.....	640,000	Detroit & Buffalo Steamship Co.
Detroit	Pass. and frt. stmr.	366	350	55	19-6	.....	Eight Scotch	.....	.....	.....	640,000	Detroit & Buffalo Steamship Co.

BUILDING AT WORKS OF CRAIG SHIP BUILDING CO., TOLEDO, O.

Toledo	Cargo stmr.	220	204	40	16	15, 25, 42x36.	Two Scotch, 11x10.	Natural	175	2,000	\$110,000	Chas. Beatty of Buffalo, and others.
Toledo	Cargo stmr.	198	184	38	14½	15, 25, 42x36.	Two Scotch, 11x10.	Natural	180	1,800	110,000	Swayne & Hoyt, San Francisco, Cal.
Toledo	Cargo stmr.	376	356	50	28	20, 34½, 55x40.	Two Scotch, 12-6x12.	Natural	.....	5,000	235,000	Thomas Adams and others, Detroit.
Toledo	Oil stmr.	258	242	42	26	20, 34½, 55x40.	Two Scotch, 12-6x12.	Natural	.....	2,800	150,000	.....

BUILDING AT WORKS OF JENKS SHIP BUILDING CO., PORT HURON, MICH.

Port Huron	Cargo stmr.	257	243	43	26½	17½, 28, 47x40.	Two Scotch, 12x11-6.	Natural	180	3,000	\$150,000	Jenks Ship Building Co., Port Huron.
Port Huron	Light-house tender	160½	151	28	14	22 and 42x36.	Two Cylinder, 11½x11.	Natural	180	.....	108,000	United States lighthouse service.

BUILDING AT BERTRAM ENGINE WORKS, TORONTO, ONT.

Toronto	Pass. stmr.	340	.....	.....	.....	Inc. Trip-exp.	Six Scotch	Howden	.....	.....	\$350,000	Richelieu & Ont. Nav. Co., Montreal.
Toronto	Cargo stmr.	260	242	42	26	Triple-exp.	Two Scotch	Natural	.....	2,800	150,000	St. Law. & Chic. Nav. Co., Toronto.

BUILDING AT WORKS OF COLLINGWOOD SHIP BUILDING CO., LTD., COLLINGWOOD, ONT.

Collingwood	Cargo two barge	390	376	46	26	.....	.....	.....	.....	5,600	\$180,000	F. H. Clergue, Sault Ste. Marie, Ont.
											179,800	\$10,273,000

Extensive Operations in Small Boats.

The Daimler Manufacturing Co., Long Island City, New York, write as follows: "The following boats are now in course of construction: One full-cabin cruising launch, 50 ft. long, 9 ft. beam, straight stem and square stern, equipped with one 25 H.P. Daimler motor; one full-cabin cruising launch, 51 ft. long, 11 ft. beam, straight stem and torpedo stern, equipped with one 25 H.P. Daimler motor; one full-cabin cruising launch, 48 ft. long, 9 ft. beam, clipper stem and square stern, equipped with one 16 H.P. Daimler motor; one half-cabin cruising launch, 45 ft. long, plumb stem and square stern, equipped with 16 H.P. Daimler motor; one half-cabin cruising launch, 45 ft. long, clipper stem and round stern, equipped with 16 H.P. Daimler motor; two half-cabin launches, 35 ft. long, straight stem and round sterns, equipped with 12 H.P. Daimler motors; several half-cabin launches, 33 ft. long, straight stems and round sterns, equipped with 7 H.P. Daimler motors. In addition to these we are building for stock a large number of 21-ft. and 25-ft. open launches, all to be equipped with Daimler motors. Plans are now being prepared for a yacht to be built for a gentleman residing in New York city. This vessel will measure 105 ft. over all and 16 ft. beam and will be equipped with two 50 H.P. Daimler motors. It will have a low trunk cabin, schooner-rigged, and specifications call for mahogany finish throughout. The furnishings are to be of the most elaborate kind. When completed we expect it will be the most comfortable and speediest power boat of its size afloat. With the addition of numerous wood-working and other machines our facilities have been greatly increased. The marine department is under the supervision

of Mr. H. T. Corey, a naval architect of considerable experience in the construction of power boats. Due to his knowledge, both in designing and construction work, and combined with the recognized merits of the Daimler engines, this department promises to exceed in volume of business any previous season in the history of the company."

E. A. Ely, Middletown, Conn., is building the following: Twenty-five launches, 17 ft. long, for Palmer Bros., Ascot, Conn., to be fitted with 1½ H.P. Palmer motors; 18-ft. gasoline launch for S. K. Montgomery, Bristol, Conn.; 18-ft. launch for Bridgeport Motor Co., Bridgeport, Conn.; 30-ft. launch for Hayes & White, Middletown, Conn.; two 30-ft. launches for the Rhode Island Motor Co., Providence, R. I.; a 40-ft. launch for C. M. Woodward, West Springfield, Conn., to be fitted with Truscott motor; a 28-ft. raceabout sailing boat for Way Bros., Hartford, Conn.

The British Columbia Marine Railway Co., Ltd., of Esquimalt and Vancouver, B. C., say: "In Esquimalt we have this year installed a complete plant for repairs to iron and steel vessels and have already handled heavy repairs on the Harda, Annie and Hating, besides several minor jobs. We are now arranging for a similar plant here in Vancouver and will be very well equipped to handle repairs rapidly. We have also recently established the British Columbia Salvage Co., Ltd., of Vancouver and Victoria, and have a wrecking plant that includes all the necessary pumps, hawsers, diving gear, hydraulic jacks, etc. The company is made up of prominent shipping men in these two cities and we are prepared to handle any salvage job that may present itself. We have also experienced divers."

MERCHANT SHIP BUILDING IN AMERICA.

In the following summary of ship building operations at hundreds of yards on the Atlantic and Pacific coasts and western rivers no effort has been made to gather totals as to value or tonnage. The purpose of the summary is to show what is now actually under construction in the various yards of the country. The reports are in every case from the builders.

William Cramp & Sons Ship & Engine Building Co., Philadelphia, Pa.:

Pass. and frt. steel stmr. Kroonland and Finland for the International Navigation Co., New York; 560 ft. long; two sets of three-crank triple-expansion engines; twin screws; nine single-ended boilers; 10,000 H.P.

Oil tank stmr. for the Standard Oil Co., New York; 360 ft. long; one three-crank triple-expansion engine; single screw; two single-ended Scotch boilers; 5,000 H.P.

Cruiser of 3,200 tons displacement for the Turkish navy.

For vessels building for the United States navy by this firm, as well as other firms that engage in the construction of vessels of war, see naval table on a preceding page.

Newport News Ship Building & Dry Dock Co., Newport News, Va.:

Steel steamships Siberia and Korea for the Pacific Mail Steamship Co., San Francisco, Cal.; 550 ft. long; quadruple expansion engines; twin screws; twelve boilers; 18,000 H.P.

El Alba, steel steamer for the Morgan line, New York; 379.8 ft. long; three double-ended boilers; triple-expansion engines; single screw; 5,000 H.P.

For naval vessels which this company is building, see naval table.

Maryland Steel Co., Sparrow's Point, Md.:

Two twin-screw frt. stmr. (Shawmut and one unnamed) for the Boston Steamship Co., Boston, Mass.; 505 ft. long; triple-expansion engines; four Scotch boilers; cost \$900,000; 4,000 H.P.

Two twin-screw pass. and frt. steamers for the Atlantic Transport Co., Baltimore, Md.; 507 ft. long; twin screw triple-expansion engines; four Scotch boilers; cost \$1,000,000; 5,000 H.P.

For naval vessels, see naval table.

Union Iron Works, San Francisco, Cal.:

Pass. and frt. stmr. Spokane for Pacific Coast Steamship Co.; 284 ft. long; triple-expansion; single screw; three Babcock & Wilcox boilers; cost \$385,000.

Stmr. Alaskan and Arizonian for the American-Hawaiian Steamship Co.; 488 ft. long; quadruple-expansion engines; twin-screws; three Scotch boilers with Howden draft; cost, \$800,000 each.

Steel caisson for San Francisco Dry Dock Co.; 105 ft. long; pumping machinery only; cost \$65,000.

Two steel caissons for dry dock for Russian government; 107 ft. long; pumping machinery only; cost \$74,000 each.

For naval vessels see table of naval vessels on preceding page.

New York Ship Building Co., Camden, N. J.:

Single-screw stmr. J. M. Guffey for the J. M. Guffey Petroleum Co., Pittsburgh, Pa.; 309.7 ft. long; triple-expansion engine; two Scotch boilers.

Twin-screw stmr. Texan for American Hawaiian Steamship Co.; 484.3 ft. long; quadruple-expansion engines; three Scotch boilers; 3,400 H.P.

Twin-screw stmr. Nevadan and Nebraskan for the American-Hawaiian Steamship Co.; 360 ft. long; triple-expansion engines; two Scotch boilers; 3,000 H.P.

Twin-screw stmr. Minnekakda and Minnelora for the Atlantic Transport Co.; 615.3 ft. long; triple-expansion engines; four double and two single-ended Scotch boilers; 12,000 H.P.

Twin-screw stmr. Massachusetts and Mississippi for the Atlantic Transport Co.; 505.6 ft. long; triple-expansion engines; two double and two single ended Scotch boilers; 6,000 H.P.

Bath Iron Works, Bath, Me.:

Steel steam yacht Pantooset for A. S. Bigelow, Boston, Mass.; 211 ft. long; triple-expansion engines; single screw; three Almy boilers; 1,200 H.P.

Machinery for wooden tug boat building by the Kelley, Spear Co., Bath, Me., for Commercial Tow Boat Co., Boston, Mass.; one fire box boiler and compound engine, 15 and 34 by 22 in.; 500 H.P.

Machinery for wooden government dredge, building at Belfast, Me., for Cumberland sound; compound engines, 22 and 44 by 30 in; two Scotch boilers; 700 H.P.

For naval work upon which this company is engaged, see naval table.

Steel barge for New York parties; length, 315 ft.; breadth, 46.3 ft.; depth, 29 ft.

Neafie & Levy Ship & Engine Building Co., Philadelphia, Pa.:

Steel pass. and frt. stmr. Calvert for the Weems line, Baltimore, Md.; 190 ft. long; compound engine; single screw; one Scotch boiler.

Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y.:

Composite stmr. Bache for Coast Survey service; 160 ft. long; single screw; compound engine; one Scotch boiler.

Wooden ferry boat North Beach for College Point line; 175 ft. long; paddle beam engine; one boiler, locomotive type.

Three-masted steel schr. yacht Shenandoah for Mr. Gibson Fahnestock, 134 ft. long.

Wood steam lighter for Arbuckle Bros.; 115 ft. long; single-screw; high-pressure engine; two boilers of leg type.

Wood steam lighter for Townsend & Downey; 82 ft. long; single screw; high-pressure engine; one boiler of leg type.

Two-masted steel schr. yacht for the emperor of Germany; 160 ft. long.

Two-masted steel auxiliary schr. yacht for Mr. Fabbri; 108 ft. long.

Steel sloop for 60-rater class for Mr. Pynchon; 88 ft. long.

Two oil barges for Standard Oil Co.; 372 ft. long.

Rebuilding steel stmr. Saale for Luckenbach Bros.; 440 ft. long; triple-expansion engine; two Scotch boilers.

Eastern Ship Building Co., New London, Conn.:

Two merchant stmr., steel, for Great Northern Steamship Co.; 635 ft. long; 21,000 gross tons; triple-expansion, twin-screw engines; Niclausse water-tube boilers; 10,000 H.P.

Harlan & Hollingsworth Co., Wilmington, Del.:

Steel stmr. Pathfinder for H. T. Knowlton and Amos D. Carver; 325 ft. long; triple-expansion engines; two Scotch boilers; 1,200 H.P.

Ferryboat Bound Brook for Central Railway of New Jersey; 207 ft. long; four cylinder, triple-expansion engine; three boilers; 1,157 H.P.

Steel stmr. Brandon for the Old Dominion Steamship Co., New York; 213 ft. long; triple-expansion engines; two Scotch boilers; 1,200 H.P.

Port Lee ferry for the Riverside & Port Lee Ferry Co., New York; 180 ft. long; three-cylinder compound engine; two Scotch boilers; 850 H.P.

Steel stmr. William G. Payne for the Bridgeport Steamboat Co.; 257 ft. long; two-cylinder, compound engine; four Scotch boilers; 2,000 H.P.

Steel stmr. Sagamore for the W. & A. Fletcher Co., Hoboken, N. J.; 203 ft. long; beam engine; two lobster-back boilers; 700 H.P.

Auxiliary steel yacht for James Lemoine & Crane; 145 ft. long; compound engine; two Almy water-tube boilers.

Steel ferryboat for the Central Railroad of New Jersey; 207 ft. long; triple-expansion engine; three boilers; 1,157 H.P.

Steel steamboat for B. C. & A. Ry.; 188 ft. long; beam engine; one dog-house boiler.

Lewis Nixon's Crescent Ship Yard, Elizabethport, N. J.:

For naval vessels which this company is constructing, see naval table. No reply was received to inquiries regarding merchant ship construction.

Delaware River Iron Ship Building & Engine Works, Chester, Pa.:

Steel stmr. City of Memphis for the Ocean Steamship Co., Savannah, Ga.; 395 ft. long; triple-expansion engines; single screw; four Scotch boilers; cost \$500,000; 3,000 H.P.

Steel stmr. City of Chester for the Chester Shipping Co., Chester, Pa.; 150 ft. long; compound engines; single screw; one Scotch boiler; cost \$65,000.

Fore River Ship & Engine Co., Quincy, Mass.:

Seven-masted steel schr. for Boston parties. Length, 368 ft.; beam, molded, 50 ft.; depth, molded, 34 ft.; displacement, 10,000 tons.

For naval vessels which this company is constructing, see naval table.

The William R. Trigg Co., Richmond, Va.:

Steel revenue cutter Tuscarora for the United States revenue cutter service; 178 ft. long; three cylinder, triple-expansion engine; single screw; two Scotch boilers; 1,200 H.P.

Steel revenue cutter No. 8 for the United States revenue cutter service; 205 ft. 6 in. long; three cylinder, triple-expansion engine; single screw; four Scotch boilers; 2,400 H.P.

Steel pass. stmr. Virginia for the Chesapeake & Ohio Railway; 200 ft. long; three cylinder, triple-expansion engine; twin screws; two Thornycroft boilers; 2,600 H.P.

Steel pass. and frt. stmr. for Old Dominion Steamship Co., New York; 200 ft. long; three cylinder, triple-expansion, single screw; two Scotch boilers; 1,300 H.P.

Steel tug Lancaster for the Pennsylvania Railway; 105 ft. long; compound engine, single screw; one Scotch boiler.

Steel suction dredge for United States engineer's office; 271 ft. long; fore-and-aft vertical, inverted compound engine; twin screws; four Scotch boilers; 1,300 H.P.

Steel tank steamer for Standard Oil Co.; 374 ft. long; three cylinder, triple-expansion engine, single screw; two Scotch boilers.

Risdon Iron Works, San Francisco, Cal.:

Stmr. Kingfisher for New England Fish Co.; 138 ft. long; triple-expansion engine and Scotch marine boiler; cost \$75,000.

Pass. and frt. stmr. Romona for Pacific Coast Steamship Co.; wooden hull; 205 ft. long; triple-expansion fore-and-aft engine of 900 H.P.

The Pusey & Jones Co., Wilmington, Del.:

Steel hull, side-wheel pass. stmr. for New Bedford, Martha's Vineyard & Nantucket Steamboat Co., New Bedford, Mass.; 187 ft. long; vertical beam engine; two return tubular boilers; 88 H.P.; approximate cost, \$100,000.

Steel hull, stern paddle-wheel frt. and pass. stmr. for foreign account; two high-pressure non-condensing engines; one locomotive boiler; approximate cost, \$37,000.

Steel steam yacht for J. Maxwell Rogers, New York; 170 ft. long; four-cylinder triple-expansion engine; two Almy water-tube boilers; engine building by J. W. Sullivan, New York; cost \$90,000.

Steel screw pass. and frt. steamer for C. H. Holmes, New York; 130 ft. long; fore-and-aft compound, single-screw engine; one Scotch boiler; cost \$40,000.

Moran Bros. Co., Seattle, Wash.:

Steel lighthouse tender Heather for lighthouse board; 178½ ft. long; compound engine; two Scotch boilers. Rebuilding stmr. Williamette, formerly of Pacific Coast Steamship Co. Engaged on extensive repairs to several steamers.

For naval work upon which this company is engaged, see naval table.

Iowa Iron Works Co., Dubuque, Iowa:

Stmr. P. Sprague for Monongahela River Consolidated Coal & Coke Co., Pittsburgh, Pa.; 318 ft. long; compound surface condensing engine; six Hopkins patent boilers; cost \$200,000.

Steel transfer boat for Louisiana & Mississippi River Transfer Co.; 306 ft. long; high-pressure engine; cost \$185,000.

Lighthouse tender Oleander for lighthouse board; 169 ft. long; compound engine; Hopkins patent boiler; cost \$60,000.

Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y.:

Steel steam yacht for Frank Jay Gould; 185 ft. long; triple-expansion engine; Seabury water-tube boiler; cost \$125,000.

Steel steam yacht for John H. Rutherford; 117 ft. long; triple-expansion engine; twin screws; Seabury water-tube boiler; cost \$45,000.

Steel schr. yacht; 118 ft. long. Name of owner withheld.

Wooden steam yacht for John D. Archbold, New York; 100 ft. long; cost \$40,000; two triple-expansion engines and Seabury water-tube boiler.

The Holmes Ship Building Co., West Mystic, Conn.:

Five-masted wooden schr. for Sutton fleet of New Haven, Conn.; 265 ft. long; cost \$95,000.

Mr. C. D. Holmes, the manager, says that the company has contracts for several large schooners now pending. The yard is newly equipped with the latest and most improved machinery.

Howard's Ship Yard, Jeffersonville, Ind.:

Steel ferryboat for Union Ferry Co., New Orleans, La.; 130 ft. long; cost \$30,000.

Wooden stern-wheel stmr. for Lee line, Memphis, Tenn.; 160 ft. long; cost \$16,000.

Wooden stern-wheel stmr. for Lee line, Memphis, Tenn.; 250 ft. long; cost \$45,000.

Stern-wheel wood stmr. for Vicksburg & Natchez Packet Co., Natchez, Miss.; 200 ft. long; \$40,000 cost; engine 16 in., 7 ft.; high-pressure poppet valve.

Stern-wheel wooden stmr. for St. Louis & Tennessee River Packet Co.; 225 ft. long; engine 16 in., 7 ft.; high-pressure poppet valve; cost \$35,000.

George Lawley & Sons Corporation, South Boston, Mass.:

Wooden steam yacht for J. C. Strawbridge; 126 ft. long; vertical, inverted, triple-expansion engines; twin screws; one Almy boiler; cost \$50,000.

Wooden launch for William Skiddy; 53 ft. long.

Wooden schr. yacht for William S. Eaton, Jr., Boston; 73 ft. long.

John M. Brooks, East Boston, Mass.:

Five-masted schr. for Capt. A. C. Crandall, Winthrop, Mass.; 347 ft. long; cost \$155,000; to be named Horatio Adams.

Six-masted schr. for Capt. A. C. Crandall and others; 347 ft. long; cost \$156,200.

Merrill-Stevens Engineering Co., Jacksonville, Fla.:

Light-draught steel stern-wheel stmr. City of Fayetteville for the Fayetteville & Wilmington Steamboat Co., Fayetteville, N. C.; 140 ft. long; two 12 by 60 horizontal high-pressure patent valve engines; two Roberts boilers; 275 H.P.; cost \$25,000.

Stern-wheel steel frt. stmr. for Capt. W. T. Gibson, Savannah, Ga.; 150 ft. long; two horizontal high-pressure engines; cost \$18,000.

Gasoline launch for A. D. Stevens, Jacksonville, Fla.; 36 ft. long.

Wooden side-wheel pleasure boat for W. B. Baker, Eustis, Fla.; 65 ft. long; cost \$4,500.

H. D. Bendixen Ship Building Co., Eureka, Cal.:

Four-masted wooden schr. Espada for Suddell & Christensen, 6 California St., San Francisco, Cal.; length, 193 ft.; cost \$50,000.

Andrew Axton & Son, West Brownsville, Pa.:

Stern-wheel, wooden hull, sand digger and tow boat combined, for Alvin Sand Co., Pittsburg, Pa.; length, 150 ft.; high-pressure engine; cost \$25,000.

Side-wheel wooden pass. stmr. for Pittsburg & Morgantown Packet Co., Pittsburg, Pa.; length, 170 ft.; high-pressure engine and two-flued boiler; cost \$60,000.

Double sand digger, wood hull, for the Iron City Sand Co., Pittsburg, Pa.; 155 ft. long; high-pressure engine and two-flued boiler; cost \$45,000.

Samuel Ayres & Son, Nyack, N. Y.:

Steam launch for F. G. Bourne; 70 ft. long; Mosher boiler and quadruple-expansion engine.

Peter Swanson, Belvidere, Cal.:

Wooden sloop Union for McCollam Fish & Trading Co., San Francisco, Cal.; 48 ft. long; Union gas engine.

Wooden launch for Charles Petersen, San Francisco; 32 ft. long; Standard gas engine.

Hall Bros., Port Blakeley, Wash.:

Five-masted wooden schr. for Hall Bros., Port Blakeley, Wash.; 240 ft. long; cost \$80,000.

Four-masted wooden schr. for Puget Sound Commercial Co., Port Gamble, Wash.; 200 ft. long; cost \$60,000.

Four-masted wooden schr. for Port Blakeley Mill Co., Port Blakeley, Wash.; 200 ft. long; cost \$60,000.

United Engineering Works, San Francisco, Cal.:

Stmr. Redwood for A. W. Beadle & Co.; fore-and-aft compound engine; Scotch boiler; 300 H.P.

Two small tow-boats; 55 ft. long; fore-and-aft compound engine and Scotch marine boiler.

Phoenix Foundry & Locomotive Works, St. John, N. B.:

Constructing machinery for stmr. for Minas Basin Steamship Co., Canning, N. S., who are building the hull; engine compound, cylinders 15 and 32 with 30-in. stroke; Scotch boiler, 10 ft. 4 in. wide and 10 ft. long.

In addition to new lathes and planers this company has installed a pneumatic tool equipment for riveting, chipping and drilling.

New Burrell-Johnson Iron Co., Ltd., Yarmouth, N. S.:

Building a steep compound surface condensing engine for stmr., building by William Butler, Yarmouth, for Capt. Ansel Crosby; also one 6 and 12 by 8 engine and boiler for the department of marine and fisheries.

Simpson Lumber Co., North Bend, Ore.:

Four-masted wooden schr. for Simpson Lumber Co.; 210 ft. long; cost \$65,000.

Wooden steam schr., 175 ft. long; cost \$55,000.

Washburn Bros., Thomaston, Me.:

Five-masted wooden schr. James Pierce; 225 ft. keel.

Preparing to build two other schooners.

Southern Boiler Works, Mobile, Ala.:

One Scotch marine boiler for United States quarantine stmr. Charles Foster.

Two Scotch marine boilers for Lee Kimball of Mobile for two new tug boats building by him.

One Scotch marine boiler for stmr. Fearless, owned by Lake Barque Canal Co., New Orleans.

One Scotch marine boiler for Messrs. Hunter, Benn & Co. of New Orleans for a tug being built by Capt. P. J. Dempsey.

One Scotch marine boiler for Messrs. Wolfe & Walker, New Orleans, for a new tug.

This firm has just equipped its shop with a new boiler and installed a complete air plant, consisting of compressors, drills and hammers.

George H. Hitchins, Hoquaim, Wash.:

Four-masted sailing schr. Resolute for E. K. Wood Lumber Co., San Francisco; 201 ft. over all; cost \$50,000.

Four-masted schr. Melrose for J. J. McKinnon, San Francisco, Cal.; cost \$42,500.

Four-masted schr. Melrose for the E. K. Wood Lumber Co.; cost \$42,500.

The Raritan Dry Dock Co., Perth Amboy, N. J.:

Mud digger hull for Henry Du Bois Sand Co., New York; 106 ft. long.

Steam lighter hull for S. L. Saville, New York; 91 ft. long.

Three scow barges; for the market, of the following lengths: 128 ft., 100 ft. and 85 ft.

Thames Tow Boat Co., New London, Conn.:

Preparing to build two sea-going barges for itself; one to carry 2,000 tons and the other 4,000 tons.

This company now has two marine railways. The large one has a capacity of 2,500 tons deadweight and can take out vessels up to 310 ft. long and 63 ft. wide, with a depth of water over the outer blocks of 21 ft. The smaller one has a capacity of 1,000 tons deadweight; 195 ft. long, 50 ft. wide and 16 ft. of water over the outer blocks.

W. A. Boole & Son, San Francisco, Cal.:

Four-masted barkentine Koks Head for Hind, Rolph & Co., San Francisco, Cal.; 245 ft. long; cost \$80,000.

Four-masted barkentine Makaweli for Hind, Rolph & Co., San Francisco, Cal.; 200 ft. long; cost \$65,000.

A. & M. Gamage & Co., South Bristol, Me.:

Wooden stmr. for Damariscotta Steamboat Co., Damariscotta, Me.; 80 ft. long; fore-and-aft compound, single screw; cost \$12,000.

J. H. Pane & Son, Boston, Mass., are building the engine and Allen & Sons, Worcester, Mass., are building the boiler for this steamer.

West Oakland Ship Yards of Southern Pacific Co., West Oakland, Cal.:

Two car floats to carry each twelve cars; 272.6 ft. long; cost \$25,000; no engines or boilers; to be towed by tug.

W. Irving Adams, East Boothbay, Me.:

Schr. Annie E. Geele for W. S. Jordan and others, Portland, Me.; 72 ft. long; cost \$7,200.

Fishing schr. for W. A. Turner, Boothbay harbor, Me.; 78 ft. long; cost, \$7,500.

Fishing schr. for C. A. Turner, McKinley, Me.; 82 ft. long; cost \$7,500.

Water boat for F. E. Pettigrew, New London, Conn.; 40 ft. long.

J. C. Ellis & Son, Tottenville, N. Y.:

Wooden tug boat for Capt. Douglas, Brooklyn, N. Y.; 73 ft. long; cost \$15,000.

Wooden tug boat for the Red Star Towing Co., New York; 90 ft. long; cost \$20,000.

Wooden tug boat for Newtown Creek Towing Co., Long Island City, N. Y.; 75 ft. long; cost \$16,000.

Wooden tug boat for Robert White, Brooklyn, N. Y.; 65 ft. long; White engine and boiler; cost \$12,000.

Gasoline oyster dredge, wood, for William Lafuge, Princess Bay, S. I.; 40 ft. long; engine by Palmer Engine Co., Miamus, Conn.; cost \$1,500.

This firm also has a number of minor contracts.

Crawford & Reid, Tacoma, Wash.:

Wooden tug for P. T. Buschman, Tacoma, Wash.; 80 ft. long.

Wooden tug for Capt. O. G. Olsen, Tacoma, Wash.; 70 ft. long.

Wooden stmr. for P. T. Buschman, Tacoma, Wash.; 120 ft. long.

Wooden barge for Tacoma Tug & Barge Co., Tacoma, Wash.; 90 ft. long.

Portland Ship Building Co., Portland, Me.:

Wooden fishing schr. for John Willard and others, Portland, Me.; 70 ft. long; cost \$5,000.

S. Gildersleeve & Sons, Gildersleeve, Conn.:

Wooden barges Mabel and Martha for sale; 105 ft. long; cost \$5,000.

Two wooden barges 105 ft. long; two wooden barges 110 ft. long; two wooden barges 121 ft. long; all for the market.

Joseph Supple, Portland, Ore.:

Propeller launch Elkader for R. D. Inman, Portland, Ore.; 67 ft. long; triple-expansion engine; one Taylor water-tube boiler; cost \$6,000.

Stern-wheel stmr. Rogue River for Burns & Bodley, Portland, Ore.; 65 ft. long; cost \$3,500.

Two scows 90 ft. long and two barges 120 ft. long for United States engineer corps.

Mr. Supple says that he has just put in a set of heavy marine ways which will handle a vessel of 2,000 tons or more. He has also equipped his plant with new tools.

F. M. Codina, foot Dauphin St., Mobile, Ala.:

Tug boat for Hunter, Berm & Co., Mobile, Ala.; 62 ft. long; cost \$6,000; compound engine and Scotch boiler.

Burlee Dry Dock Co., Port Richmond, S. I., New York:

Steam steel yacht for Mr. W. B. Leeds, 71 Broadway, N. Y.; 252 ft. long; four cylinder, triple-expansion engine; six Almy water-tube boilers.

Steel steam yacht for Mr. D. G. Reid, 71 Broadway, N. Y.; 213 ft. long; three cylinder triple-expansion engine; four Almy water-tube boilers.

Steel tug boat for Lehigh Valley Railroad Co.

Steel barge for Standard Oil Co.; 161 ft. long.

Steel barge for Standard Oil Co.; 310 ft. long.

Polson Iron Works, Toronto, Ont.:

This company has just cleaned up its dredge work, building two large dredges for the Dominion government amounting to \$400,000, and have only closed a small contract for a yacht amounting to \$10,000 for the lower St. Lawrence. The company is reclaiming about four acres of ground in front of its works in Toronto bay for an increase in its ship yard plant and will lay out the whole during the present year in the most modern manner.

Greenport Basin & Construction Co., Greenport, N. Y.:

Wooden steam yacht for A. Schwartzmann, New York; 139 ft. long; cost \$30,000.

Wooden sloop for Charles H. Stevenson, New York; 32 ft.; cost \$1,600.

H. M. Bean, Camden, Me.:

Five-masted wooden schr. for Capt. J. G. Crowley, Boston, Mass.; 409 ft. long; cost \$110,000.

William McKie, East Boston, Mass.:

Four-masted wooden schr. Kenwood for J. S. Emery & Co., Inc., Boston; 202 ft. long; cost \$55,000.

Kelley, Spear Co., Bath, Me.:

Two four-masted wooden coal barges for H. A. Dean, agent, Taunton, Mass.; 280 ft. long; cost \$70,000 each.

Four-masted schr. for B. T. Petty & Co., New York; 173 ft. long; cost \$40,000.

Wooden tow boat for Commercial Tow Boat Co., Boston; 102 ft. long; compound engine; single screw; cost \$38,000.

Twin-screw pass. stmr. for M. C. R. R. Co., Portland, Me.; 157 ft. long; cost \$59,000.

John H. Dialogue & Son, Camden, N. J.:

This firm is constructing a stmr. 375 ft. long with triple-expansion engines and three Scotch boilers, a barge 250 ft. long, and three tug boats, 154 ft., 100 ft. and 85 ft. long respectively. The names of the owners were omitted by the company.

Jacobson & Peterson, foot of Twenty-fourth St., South Brooklyn, N. Y.:

Two barges for O'Brien Bros., 62 South St., Brooklyn, N. Y.; 100 ft. long; cost \$12,000 each.

Theodore A. Crane's Sons, Erie Basin, Brooklyn, N. Y.:

Five open ballast barges for the Consolidated Gas Co., New York; 85 ft. long; cost \$4,000.

This firm is now building a new dry dock, 350 ft. length of keel blocks, 90 ft. wide, to consist of five sections. It will have a lifting capacity of 5,000 tons and is expected to be in operation by March 1.

Arthur Sewall & Co., Bath, Me.:

Steel ship Atlas for the Standard Oil Co.; 330 ft. long.

Steel barge for Standard Oil Co.; 280 ft. long.

Steel schr. for Arthur Sewall & Co., Bath, Me., 251 ft. long.

Sawyer Bros., Millbridge, Me.:

Four-masted wooden schr. 150 ft. long; cost \$22,000; building for the market.

J. M. Bayles & Son, Port Jefferson, L. I.:

Sloop yacht for George G. Williams; 65 ft. long; cost \$10,000.

Motor yacht for Frank M. Lipton; 55 ft. long; cost \$8,000.

McCosker & Co., Baltimore, Md.:

Wooden tug for Philip Weaver & Son, Baltimore, Md.; 103 ft. long; approximate value, \$30,000; fore-and-aft compound Neafie & Levy engine.

Combination dredge for the Bath Dredging Co., Bath, Me.; 90 ft. long; cost \$27,000.

Tug for Baltimore parties; 110 ft. long; cost \$32,000.

Washburn Bros., Thomaston, Me.:

Five-masted wooden schr. for themselves and others; 240 ft. long; cost \$96,000.

They are cutting the frames for two more schooners, one to be a four-master and the other not as yet determined upon.

Saunders Bros., Saundertown, R. I.:

Steam ferry boat for themselves; 90 ft. long; cost \$10,000; two high-pressure engines.

Petersburg Iron Works Co., Petersburg, Va.:

United States light vessel No. 74 for the lighthouse board; 125 ft. long; compound engines; two Scotch boilers.

Sea-going suction dredge for Charleston, S. C., harbor, for the United States engineer's department; 200 ft. long; compound engine; two Scotch boilers.

Carlton, Norwood & Co., Rockport, Me.:

Wooden schr. for themselves as agents; 215 ft. long; cost \$70,000.

F. S. Bowker, Phippsburg, Me.:

Three-masted wooden sailing schr. for James J. Feore, Scranton, Miss.; 142 ft. long; \$24,000 approximate value.

Perth Amboy Dry Dock Co., Perth Amboy, N. J.:

Car float for twelve cars for Pennsylvania Railroad Co.; 250 ft. long; cost \$25,000.

Clay barge for Edward Pfeiffer, Fords, N. Y.; 90 ft. long; cost \$3,500.

Baltimore Marine Railway Machine & Boiler Works, Baltimore, Md.:

Fish stmr. William S. Brusstar for Snow Fallen Guano Co., Coon, Va.; 115 ft. long; steeple compound engine.

Tow-boat for W. Key Howard, Urbana, Va.; 60 ft. long; cost \$3,500.

Builders of Launches and Small Craft.

Frank N. Isham, Mystic, Conn., has contracts for four cabin gasoline motor launches, 36 ft. long and 9 ft. beam. They will have 10 H.P. motors.

E. Gerry Emmons, 53 Ocean street, Swampscott, Mass., is building mostly small boats for stock. Has built about 150, ranging in size from 12 to 30 ft.

Walsh & Weidner, Chattanooga, Tenn., are building a Scotch marine boiler for the steamer E. B. Lane, Jr., owned by the Farmers Mfg. Co., Norfolk, Va.

Mozena Bros., Clarington, O., are building a 42-ft. yacht for E. P. Wheat, Wheeling, W. Va., and a 50-ft. boat for Henry Shutler of New Martinsville, W. Va.

The Taunton Yacht Works, Taunton, Mass., is building a 37-ft. knockabout for E. H. Temple of Taunton, Mass., and a speed launch, 39 ft. long, for James K. Clarke of Philadelphia.

The John Stuart Co., Wollaston, Mass., say: "We have in process of construction about fifty launches, ranging in size from 15 to 50 ft. We are using our own gasoline engine in all of them."

John Ryan, Whitehall, Ky., has rebuilt his saw mill, which was destroyed by fire and which adjoins his boat yard. He has begun the construction of two canal boats of 350 tons capacity each.

James Tregarthen, Son & Co., New York (foot of Seventh street), are building two new wooden deck barges, 85 ft. and 100 ft. long respectively. They contemplate building two more of the same dimensions.

The Sharptown Marine Railway Co. say: "We are rebuilding several vessels now on our ways which are nearly complete. We have done a large year's work. We are figuring now on a schooner, a steamer and a large barge."

Vaughan D. Bacon, Barnstable, Mass., is building an auxiliary yawl, 64 ft. long, and a cruising launch, 46 ft. long, for F. A. Hyde of Barnstable, Mass.; also a cruising yawl, 33 ft. long, for Nelson Burr Gaskill of Barnstable.

Read Bros., Fall River, Mass., are building for A. Homer Skinner, Fall River, Mass., an auxiliary yawl with gasoline engine, 58 ft. long and to cost \$7,500. They are building for themselves a sloop yacht, 35 ft. long to cost \$1,600.

L. C. Embrie & Co., Quincy Point, Mass., have replaced their plant, destroyed by fire, with a new one with new machinery. They are now building for Dr. Edward C. Reynolds, 130 Marlborough street, Boston, a yawl 43 ft. long to cost \$3,000.

The John P. Smith Co., Nyack, N. Y., has bought additional property to give its works a water front of 700 ft. The company proposes to build a large basin, 450 by 250 ft., in which to store yachts, and to put up new buildings and docks at a cost of \$25,000.

E. H. Brown, Taunton, Mass., is building the following: Boat with jib and mainsail for E. H. Temple, Taunton, Mass., 36 ft. long, to cost \$1,800; boat with jib and mainsail for Mr. Park, New York, 38 ft. long, to cost \$2,800; hunting launch for Mr. Clark, Ardmore, Pa., 40 ft. long to cost \$3,000.

The Gulf of Mexico Marine Railway Co., Pensacola, Fla., say: "We are rebuilding the fishing schooner Favorite and have finished rebuilding the schooner Maud Spurling. These vessels were built in the east but do not last in our climate. The Spurling is not six years old but every timber had to be renewed this year."

David Fenton, Manchester-by-the-Sea, Mass., has under way four 37-ft. sailing yachts, one each for the following parties: Reginald Boardman, Boston; T. K. Lothrop, Jr., Boston; George Lee, Boston; Sumner Foster, Boston. He is also building a 20-ft. mahogany fin-keel yacht for Frank Gair Macomber, Boston, and a 42-ft. racing yacht for the Manchester Yacht Club.

J. T. Sharpley, Greenbackville, Va., says he had more work last season than he could do. His company is preparing to increase its yard by the addition of another railway. He has just completed a gasoline boat 40 ft. in length for W. M. Needles, Franklin City, Va. Engine was made by Delaware Machine Works, Wilmington, Del. He is doing a big business in a local craft known as skipjack.

The Nelson Yacht Building Co., Baltimore, Md., has just built two boats for the United States government, custom house service, and two 60-footers for the Standard Oil Co. Mr. L. J. Nelson and F. H. Holmes left Baltimore in one of the 50-footers and successfully delivered it to the custom officials at Gloucester, Mass. These two are the first gasoline boats ever ordered by the United States government.

H. Manley Crosby, Osterville, Mass., is building the following: Two auxiliary fishing sloops for Chatham parties, 36 ft. long, fitted with 10 H. P. Murray & Fergurth gasoline motor, cost \$2,500 each; auxiliary cat boat for Chester Robinson, Vineyard Haven, Mass., 28 ft. long, fitted with 6 H. P. Murray & Fergurth gasoline motor, to cost \$1,500; raceabout sloop for Mrs. Stewart McKee, Allegheny, Pa., 35 ft. long, to cost \$2,000.

W. B. Stearns of the Marblehead Yacht Yard, Marblehead, Mass., writes: "We are building this year only small launches in which line I intend to remain, if possible, from now on. We have had marked success with what boats we have turned out and are warranted in saying that we can do especially well in turning out good sea boats with more speed for the power than is usually thought possible. We are using gas engines."

Horace J. Conley, Green Bay, Wis., is building a 35-ft. naphtha launch for Charles W. Howard of Neenah, Wis., to cost \$2,700; and also a 30-ft. naphtha launch for T. A. W. Keickhefer, Milwaukee, Wis., to cost \$1,750. Both launches will be fitted with three-cylinder condensing engines, built by the Gas Engine & Power Co., Morris Heights, N. Y. Mr. Conley says: "I am at present building a new shop which will contain a basin for testing launches or showing them to customers in operation, summer or winter. My shops are located on rail and water, and by moving a launch her length from the basin we can pick her up with a derrick and put her in the river or upon a car with the same derrick without changing the tackle. This new building has 580 ft. of floor space and the shops complete 1,200 ft. of floor space."

FORE RIVER SHIP & ENGINE CO., QUINCY, MASS.

WITH an enviable record of past achievements in the construction of yachts and marine engines of the most approved design and workmanship, the progress of the Fore River Ship & Engine Co. in its transition to the ranks of the great ship building companies of the country has attracted general attention.

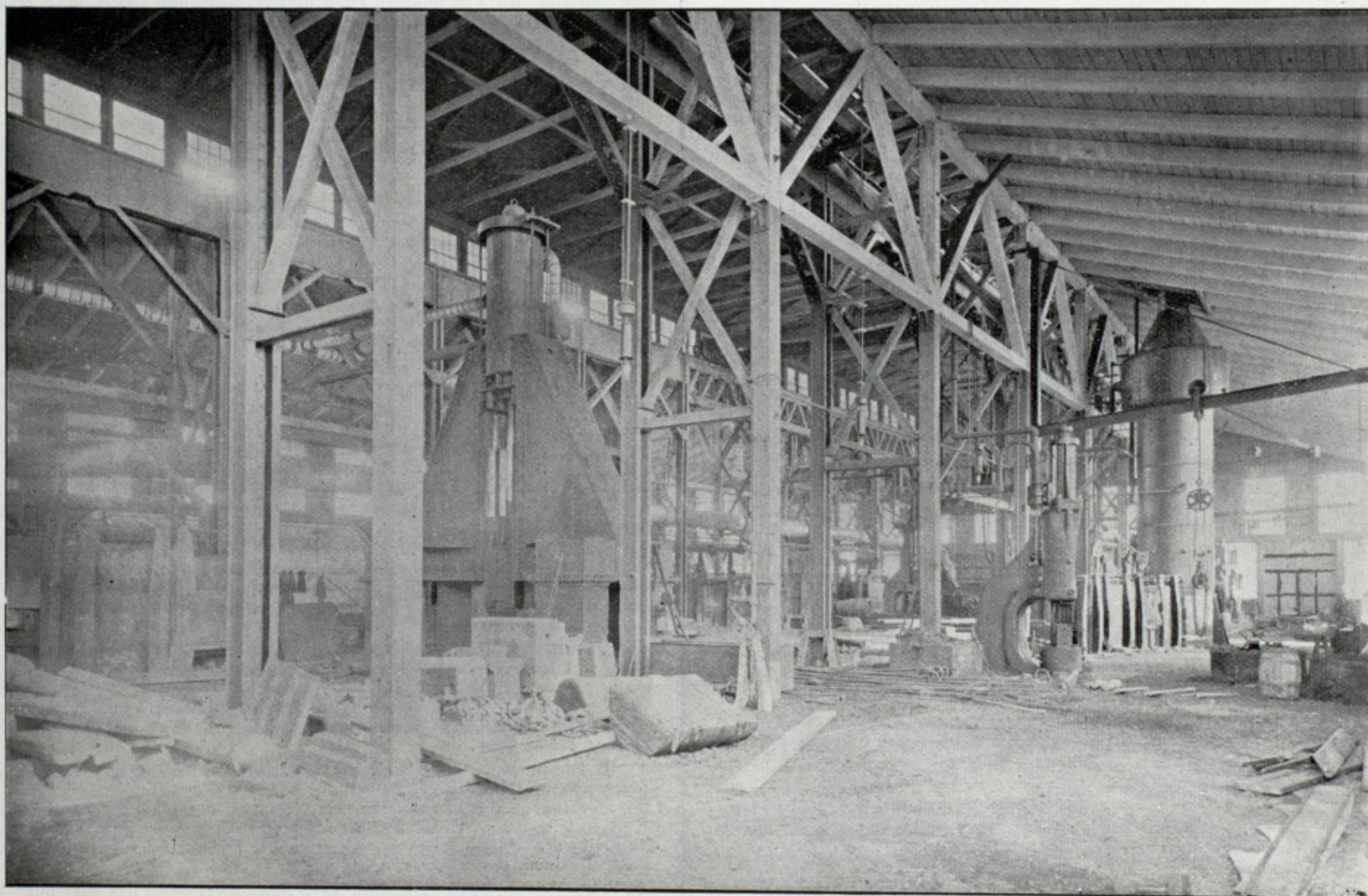
From a small beginning at Weymouth in 1884, under the title Fore River Engine Co., it had gradually outgrown its environment and early in 1900 the acquisition of contracts for larger vessels made a change of location imperative. After careful consideration of the advantages of various points along the New England coast, the present site of the works at Quincy was determined upon and the wise forethought of the company's management has been continually in evidence since commencement of work upon the new plant some eighteen months ago.

Situated upon Fore river near its outlet into Boston harbor, the distance to Boston light is short, and vessels traverse waters of even greater natural depth than from the wharves of Boston itself. The eighty acres of land included in the plant afford ample water frontage for docks and

to the bath, and the total height of the structure is 112 ft. with a floor space of 5,600 sq. ft., upon which are installed additional smaller furnaces.

The machine shop has a floor space of 76,400 sq. ft. or approximately $1\frac{3}{4}$ acres, and it is here that the most modern adaptations of electric motors to the driving of tools is in evidence. Probably the most interesting feature is the lathe equipment, particularly two boring lathes having 115-ft. beds, two 60-in. lathes having 60-ft. beds and a 72-in. crank shaft lathe. Not only is the engine work for ships under construction progressing rapidly, but here also are being rough-machined the forgings for sixty 3-in. and fifteen 4-in. fire guns, the contract for which, including the forgings, was recently awarded this company by the navy department. Additions are continually being made in the machine shop equipment and foundations are already prepared for a number of notable machines, among them two heavy forging lathes and a 30-ft. planer cutting 12 ft. square.

The ship tool shop includes 55,800 sq. ft. of floor space, and, with the exception of certain hydraulic machines, the equipment is electrically



Interior of forge showing the 20-ton hammer at works of the Fore River Ship & Engine Co., Quincy, Mass.

building berths, and along a natural creek is being built a fitting-out pier some 1,200 ft. in length, the basin being dredged to a depth of 30 ft. Considering the advantages of extended water frontage of ample depth, together with soil characteristics which are naturally adapted to heavy keel and other foundations, it is doubtful if a more ideal location could be found.

The seventeen different departments of the works are housed in substantially-constructed and well-arranged buildings and the general scheme of providing space for the extension of any one of these has already proved its value, for the machine shop, ship tool shop, and power house have already been enlarged to meet increasing demands. It is of interest briefly to review the various departments and it is perhaps in order to consider first the forge, for in this ship yard alone do we find facilities for making crank shafts and other heavy forgings required in ship and marine engine construction. Eight steam hammers are distributed over an area of 22,000 sq. ft., the heaviest being a 20-ton hammer—second to none in capacity—and the total weight of the falling parts of the eight hammers aggregates 60,000 lbs. The waste heat from the heating furnaces is utilized in generating steam for the hammers, thus insuring economy in operation, and the hammers are served by a 75-ton electric traveling crane, supplemented by one of 25 tons capacity and also by smaller jib cranes.

Closely related to the forge is the annealing plant, recently completed, in which may be annealed and oil-tempered shafts 50 ft. in length, weighing 25 tons. A vertical furnace, using oil as fuel, provides the annealing heat, which is carefully regulated by pyrometer, and a vertical tank holding 23,000 gallons of oil serves as a tempering bath. An electric traveling crane transfers the vertically-suspended shafts from the furnace

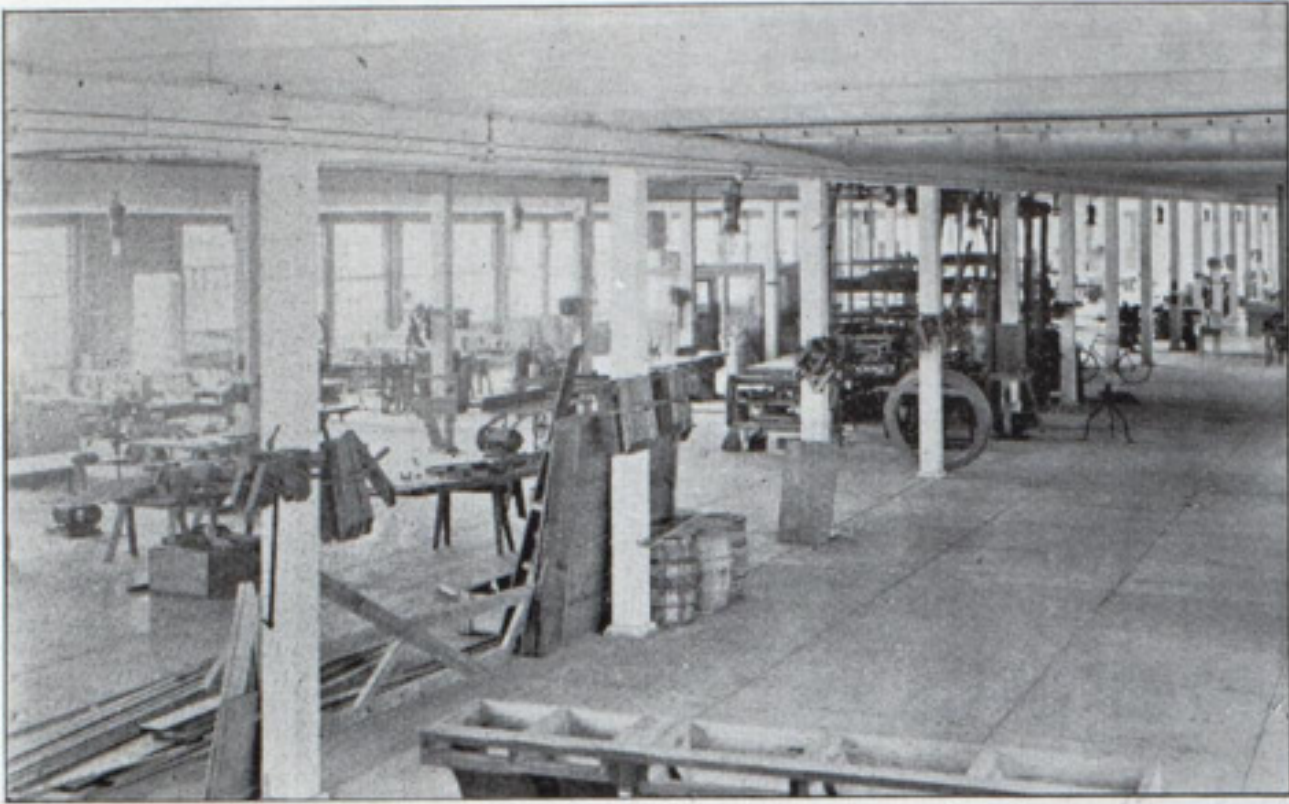
driven, being controlled by a central switch board in charge of a single operator. Among the most interesting features of the equipment is a hydraulic manhole punch, which is of an exceptionally heavy type and capable of punching holes 36x18 in. through a 1-in. nickel steel plate; also a joggling machine capable of taking plates up to $\frac{3}{4}$ in. A new beveling machine has been installed and foundations await a set of large bending rolls which are 20 in. in diameter by 32 ft. long and which have been forged and machined in the plant. The remainder of the equipment, comprising plate planers, bending rolls, shears and punches, will make it possible to meet even the most severe productive demands.

In a two-story building 304 ft. long are located the pattern and joiner shops and the mold loft, the total floor space being 43,800 sq. ft. The electric motor is again in evidence here, the band saws, circular saws, planers and other high-speed tools being connected by short belts to individual motors.

The carpenter shop, brass foundry, store house, pattern storage, pipe shop and ship carpenter shop, while all well arranged, present no features of special interest, though attention may be called to the floating machine shop, which may be towed from place to place, and, therefore, renders available an equipment ample for repair purposes and other similar work. It is now engaged in repair work upon the steamship Isle of Kent, recently in collision.

One of the most prominent structures in this ship yard, namely, the new ship house now being erected, deserves special mention. Designed to accommodate within its center span two of the largest battleships or merchant steamers, it will also provide space for a vessel under each wing and the trusses will have a total span of 325 ft. with an elevation of 100

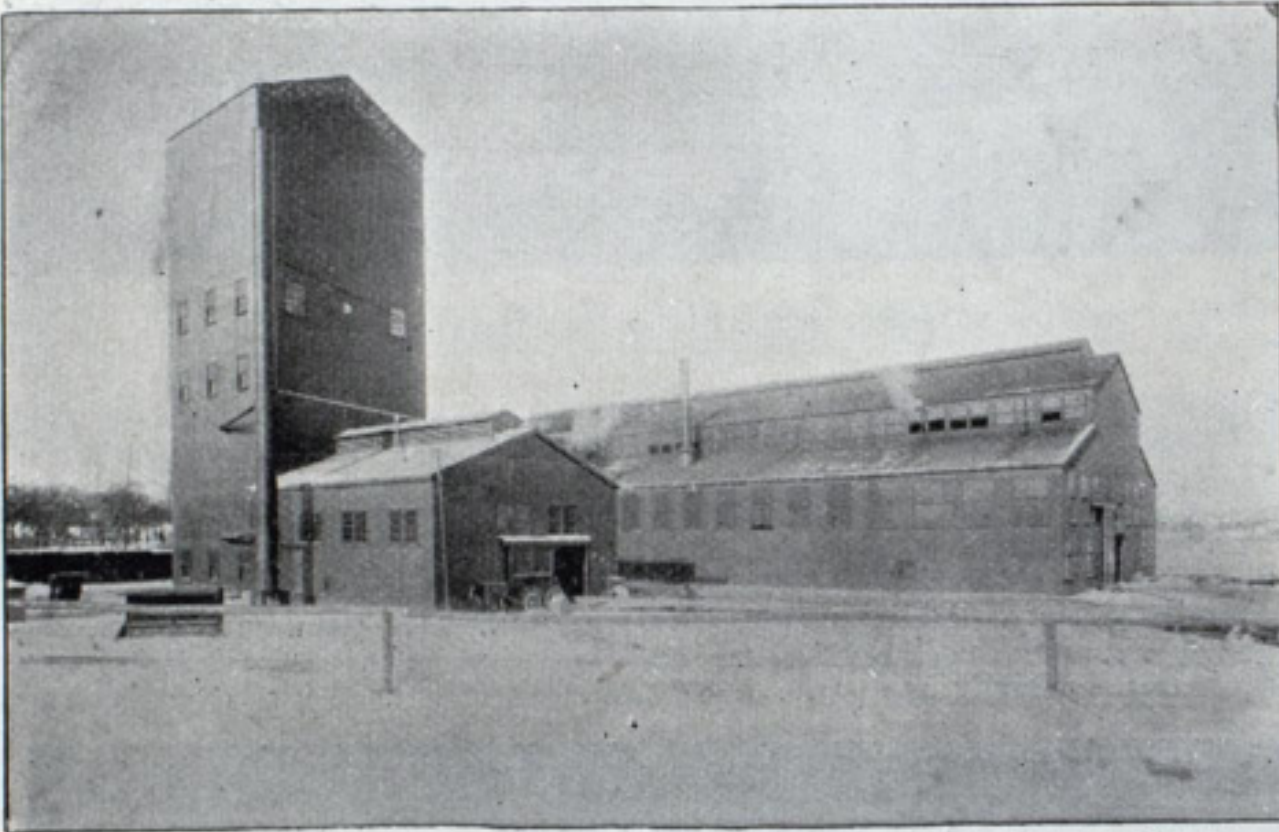
ft. to the lower chord. The total height of the building will be 150 ft. at the outer end and its present length is 490 ft., though it is designed to be extended to a length of 800 ft. in the near future, at which length it will cover in a ground space of six acres. Two electric traveling cranes



Pattern and joiner shop, Fore River Ship & Engine Co., Quincy, Mass.

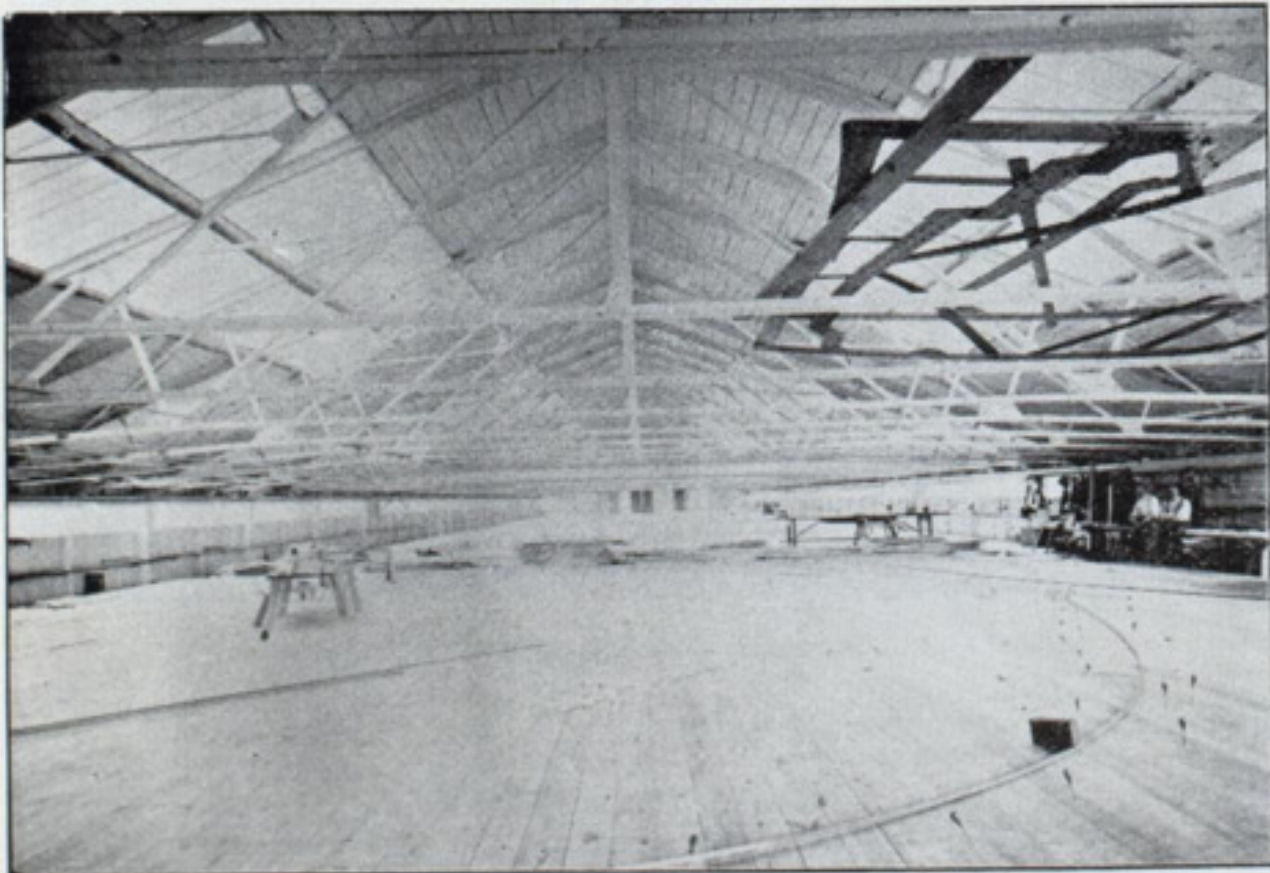
traverse the entire length of each ship and thus eight cranes are available for carrying on, under cover at one time, work upon four ships.

Fully in keeping with the advanced types of labor saving devices throughout the plant, is the folding jib gantry crane now being constructed, which will travel along the fitting-out pier. This crane will have a nominal capacity of 75 tons and will do away with the necessity



Forge and annealing shop, Fore River Ship & Engine Co., Quincy, Mass.

of warping vessels along the pier, which has been customary in case of sheer legs and revolving cranes, with which the working area is comparatively limited. At the plate yard is further evidence that the economical handling of material has had careful attention. An overhead electric crane of 150 ft. span travels along runways 800 ft. in length and thus material is transferred to or from cars on the railway track, which

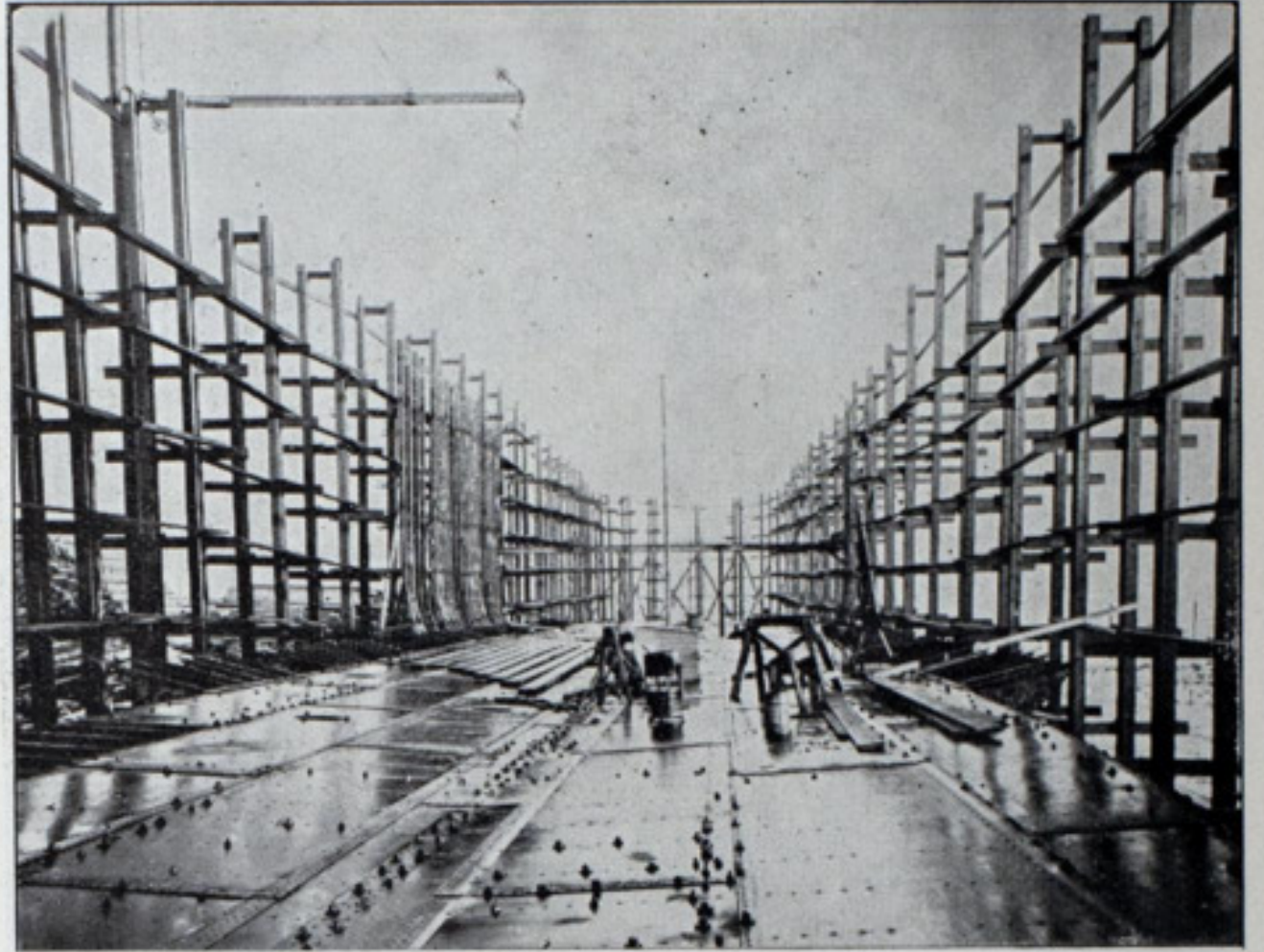


Mold loft, Fore River Ship & Engine Co., Quincy, Mass.

extends through the center of the plate yard. This track forms a part of the company's railway system, which is of standard gauge supplemented by narrow gauge tracks for use within certain of the shops. The pickling tanks are located near the plate yard and are served by an overhead

traveling crane, plates being delivered here from the plate yard and thence to the ship tool shop.

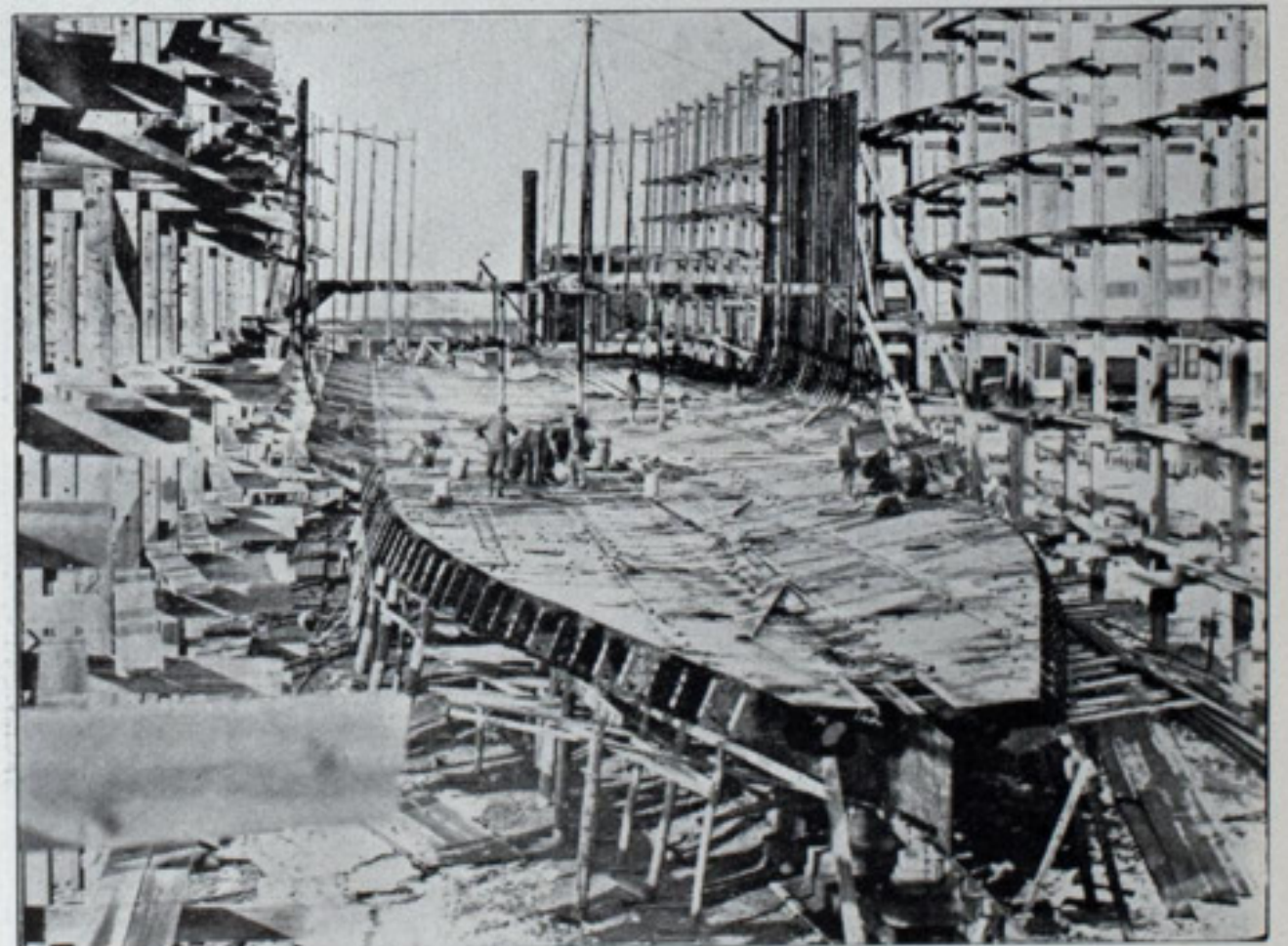
The power equipment which drives all these departments consists of electric and pneumatic units. The 220-volt direct and multi-voltage systems are used, three generators for the former and two for the latter being installed. The pneumatic plant consists of a 1000 cu. ft. compressor, which will be used as an auxiliary to a 5000 cu. ft. compressor now being erected. At the present time there are 125 motors in use, varying from $\frac{1}{2}$ H. P. to 150 H. P. The approximate distance of the various motor groups from the center of distribution is 450 ft., wires being led through 800 ft. of underground conduit and half a mile of pole line. The lighting system comprises 150 arc lamps and 1500 incandescent lamps and the average amperes at the power plant varies from 600 to 1200, and a range of speed varying from 50 to 1000 revolutions is obtained at the motors.



View of the seven-masted steel schooner building at the works of the Fore River Ship & Engine Co., Quincy, Mass.

Riveting, drilling, reaming, caulking and similar operations upon the ships are all carried on by means of pneumatic tools, the pressure being about 100 lbs. per square inch.

Thus briefly has been described a ship building plant which has been built up during the past year and a half, following carefully matured plans based upon an experience gained in high grade marine work, growing gradually from smaller to larger vessels, and meanwhile the work of production has actively continued. Lightship No. 72 was the last vessel completed at the old works; then came the launching of the two torpedo boat destroyers, Lawrence and Macdonough, and preliminary work on the protected cruiser Des Moines. The keel for the latter was laid at the



Showing the seven-masted steel schooner with some of the frames in place. Building by Fore River Ship & Engine Co., Quincy, Mass.

new plant and she is now well up in the list of sister ships in so far as completion is concerned, and will shortly be launched. The 15,000-ton battleships, New Jersey and Rhode Island, the largest vessels yet built for the navy, contracts for which were secured early in 1901, have passed the preliminary stages, and are, with a single exception, the only vessels of that class credited with progress.

Perhaps the seven-masted schooner, the keel for which was laid Nov. 1, and the frame of which is now well along, has attracted more attention than any vessel of recent years. This will be the largest sailing vessel ever constructed and will have a water line length of 368 ft.; beam, molded, 50 ft.; depth, molded, 34 ft. 5 in.; load draught, 26 ft. 6 in.; displacement at that draught, 10,000 tons.

RISDON IRON WORKS, SAN FRANCISCO.



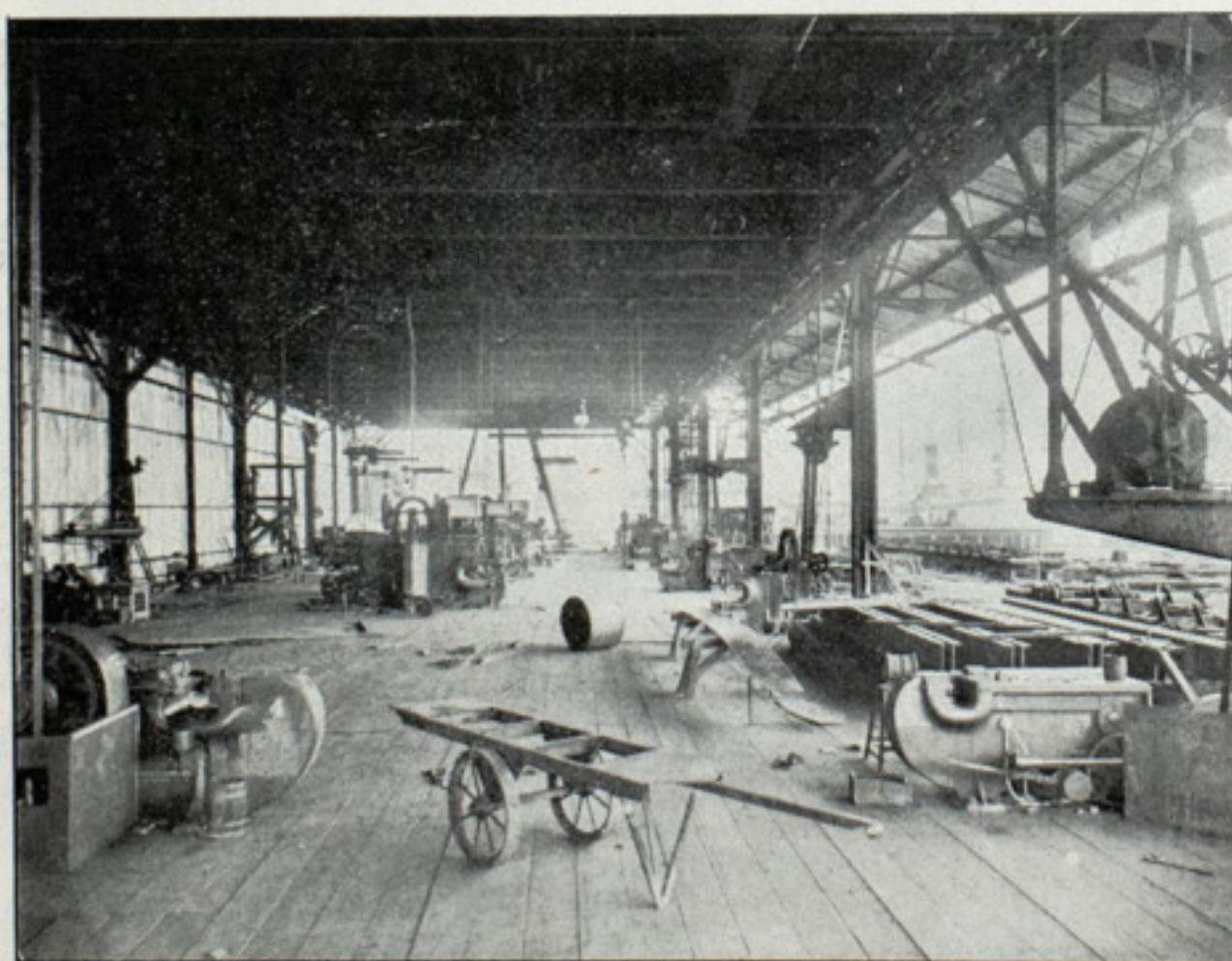
THE main shops and the ship building plant of the Risdon Iron Works are located on the water front of the Potrero, between Nineteenth and Twenty-second streets. The property consists of thirty-five acres, lying between Georgia street and the shore line which is here nominally Massachusetts street, and includes the former site of the Pacific Rolling Mills. The main entrance is at Twentieth and Louisiana streets. The main line of the Southern Pacific railway's bay shore extension is three blocks from the entrance on Illinois street. From this a spur runs down Twentieth street through the main gateway, which is 40 ft. wide, and there spreads out fan-shaped into four branches. All these tracks are interconnected by curves of 150 ft. radius, allowing a choice of two or three routes from



Interior of machine shop, Risdon Iron Works, San Francisco.

almost any point to any other, thus preventing the annoyance and delay of blocking traffic. For instance, there are four possible routes from the machine shop to the shear-legs—the ultimate destination of all large marine work. The total length of trackage about the works is four miles.

The general arrangement of the buildings is as follows: North of Twentieth street is located the ship building department proper. It consists of the mold loft and the ship tool building, plate racks and the ship building ways. South of Twentieth street the first tier of buildings is as follows, going toward the bay: New office, blacksmith shop, angle bar

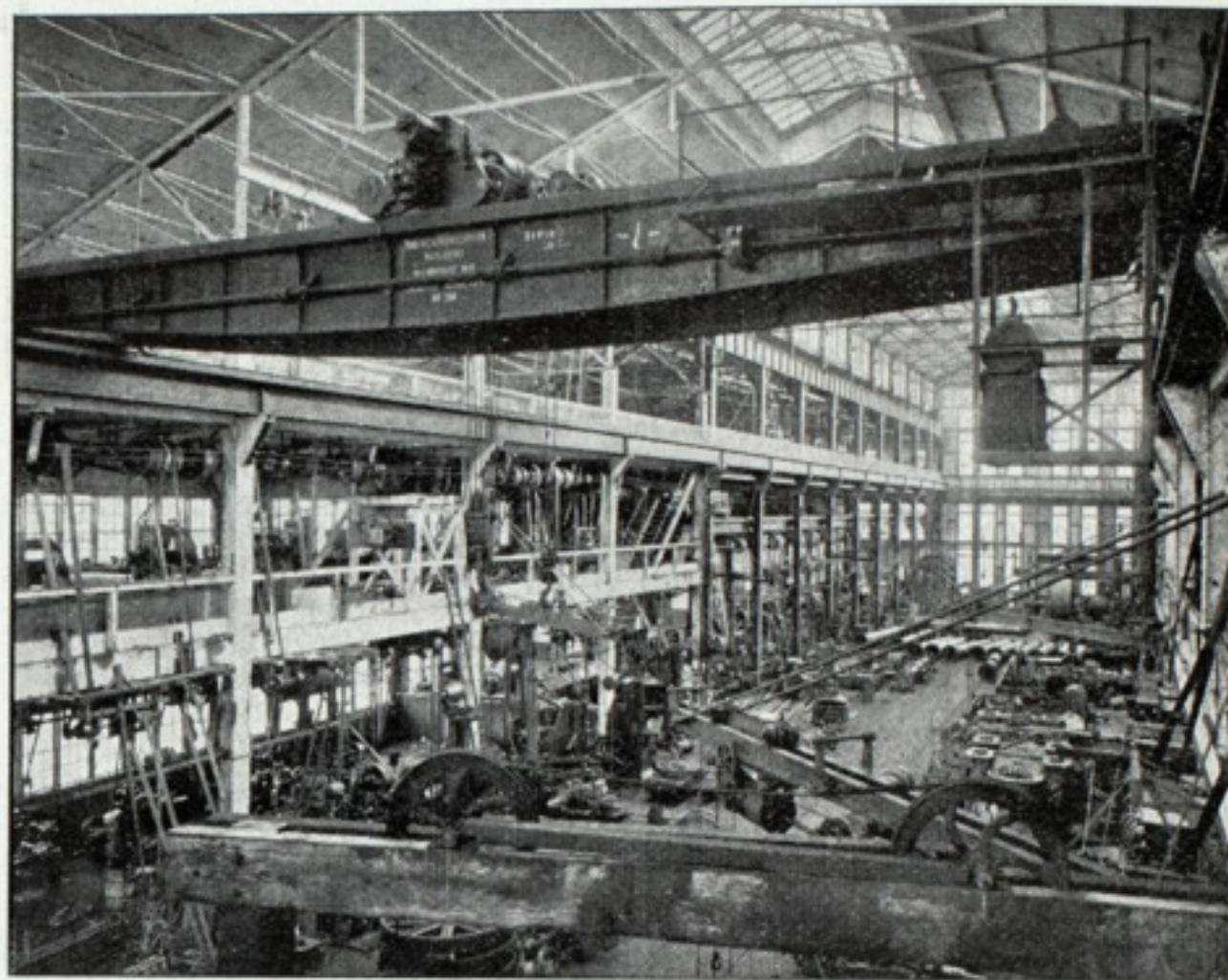


Interior, first floor, ship punch shop, Risdon Iron Works, San Francisco.

shed, warehouse, joiner and ship pattern shop and fireproofing and riggers' shops. The next tier south consists of machine shop, storeroom, power house, copper shop and boiler house. The following tier contains the erecting shop, extension to the machine shop, pattern shop, boiler shop, foundry, flask shop and flask yard. There is a complete line of wharves on the bay frontage, including a fitting-out slip, surrounded on three sides with wharfage and railroad tracks. It will be noticed that the grounds are amply provided with railway facilities—in fact a track has been laid wherever it could be of use. As all the curves are 150 ft. radius, the usual flat cars and railway yard locomotives have access to all parts of the works. The complete track system also makes it possible to utilize all the space not occupied by buildings for storage. Material and all

heavy articles are carried about the works by three yard or locomotive cranes, having a capacity of ten tons. These are also used for switching cars.

The buildings are constructed of structural steel, covered with galvanized corrugated iron, thus being fireproof throughout. The foundations are concrete piers. Under the machine shop, boiler shop, foundry and blacksmith shop, piers are laid upon bedrock, as the site of these buildings has been excavated from the surrounding hills. The ship tool building columns and each separate machine rest upon concrete piers, 9 ft. deep, which, in turn, are built upon piles from 70 to 90 ft. long, driven to bedrock. The joiner shop is similarly supported, though the distance to bedrock is not so great. The lighting facilities are ample indeed. Each



Interior of machine shop, Risdon Iron Works, San Francisco.

shop is completely equipped with arc and incandescent lamps, so that work can be carried on continuously night and day when necessary.

POWER AND POWER HOUSE.

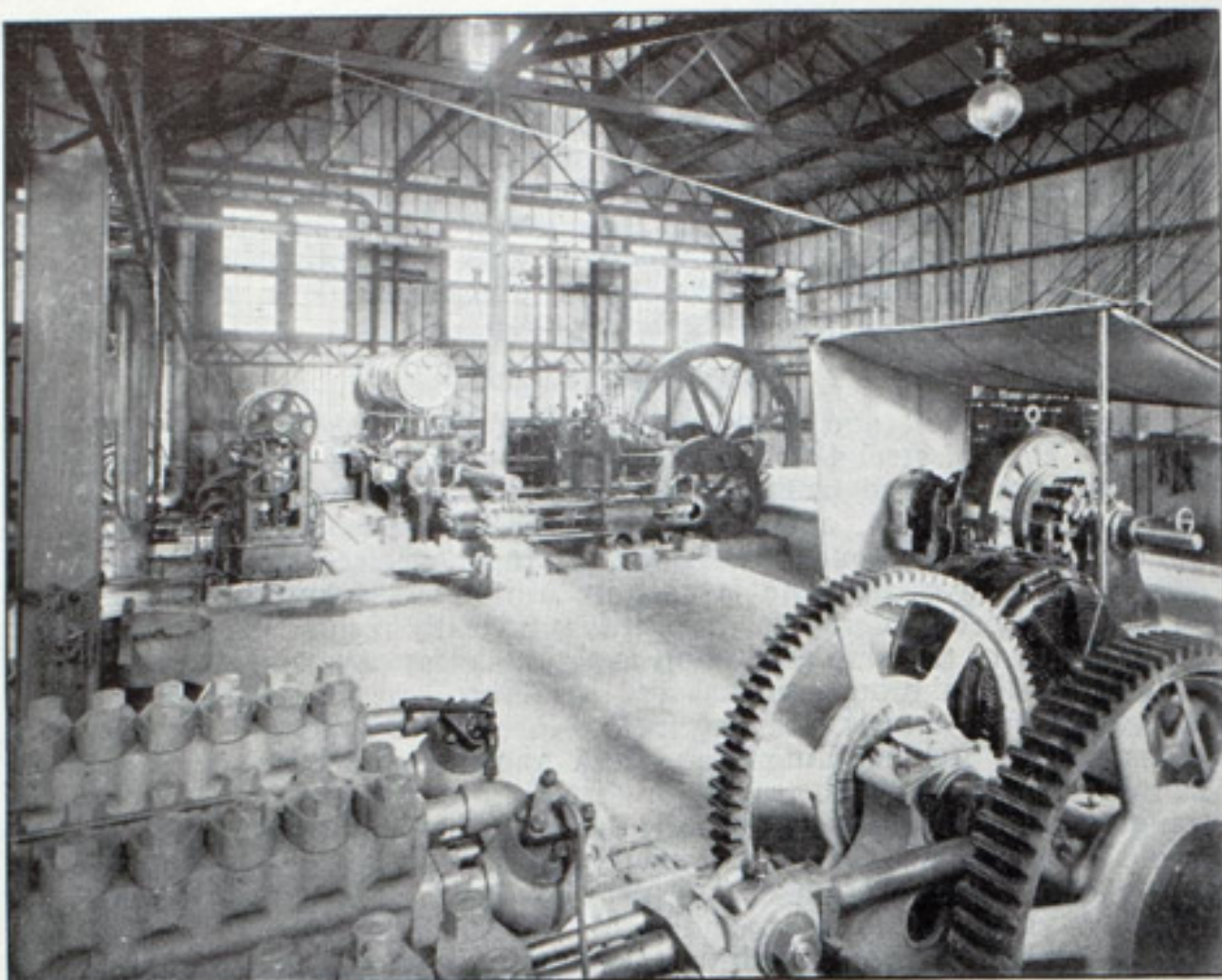
Four kinds of power are distributed completely throughout the works—compressed air, hydraulic, steam and electric. Compressed air is used for hoists, drills, riveters, caulkers and other pneumatic tools, the provision for the ship building and repairing plant, wharves and fitting out slip being especially complete. Hydraulic power is used for large riveters,



Interior of foundry, Risdon Iron Works, San Francisco.

punches, jacks, drop forging presses, hoists, keel plate benders, etc., and also for testing. Steam is used outside the power house itself for steam hammers and heating purposes. The main source of power, however, is electric. Nearly all machines, except the special hydraulic and pneumatic and the steam hammers, which require over 5 H.P., are independently driven by electric motors. The smaller machines are belt driven from line shafts, each having its own motor.

The power house is a thoroughly modern, one-story steel structure, 100 ft. by 150 ft., situated in the center of the plant. It is the producing and distributing point for the different power systems mentioned above, and also serves for the salt and fresh water distribution for drinking and fire purposes, as well as petroleum distribution for the boilers, blacksmith



Interior of power house, Risdon Iron Works, San Francisco.

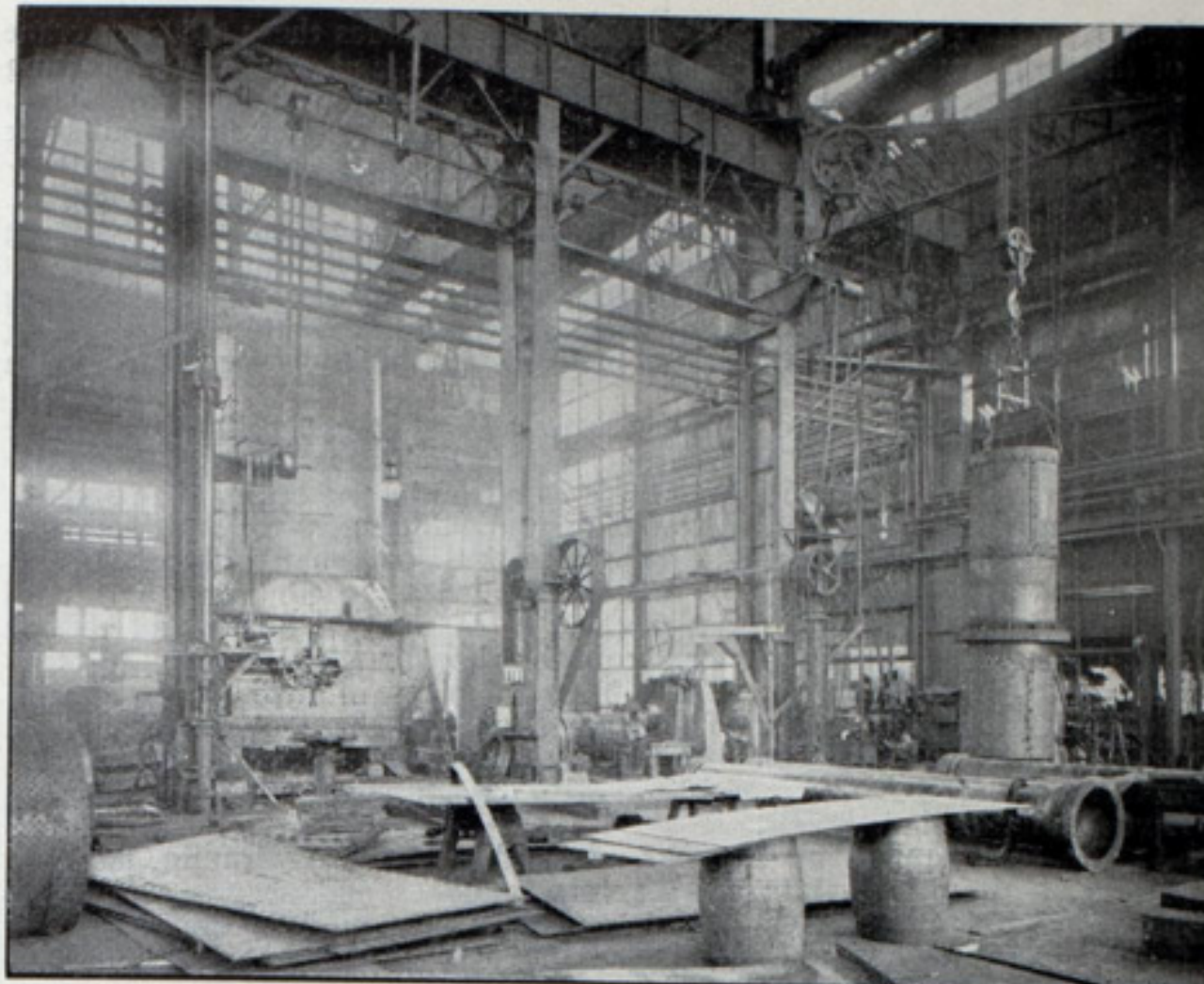
shop and boiler shop fires. The boilers (now being installed) are of the Heine water-tube type and will eventually supply all the power used in the works. They are oil-burning, as are also those upon the locomotive cranes.

The electric equipment includes: Two 250 K.W. static transformers, 11,000 to 440 volts; two 150 K.W. static transformers, 11,000 to 196 volts; one 50 K.W. static transformer, 2,200 to 110 volts; two 10 K.W. static transformers, 2,200 to 110 volts; two 10 K.W. static transformers, 440 to 110 volts; one 250 rotary converter, 196 to 220 volts. All are supplied with the necessary switches, ammeters, volt meters, watt meters and other requirements. At present power is taken from the mains of the Independent Light & Power Co. at 11,000 volts, two-phase, 60 cycles. Provision, however, has been made to install generators which will furnish all the power required. The direct-current system is used to operate all the overhead traveling cranes and two or three small motors. The alternating current system supplies power to the remaining motors and the arc and incandescent lamps.

The hydraulic power system is supplied by a 150 H.P. triple-throw, double-acting pump, driven by an induction motor. This pump produces a pressure of 1,500 lbs. per square inch and feeds a battery of four accumulators, which automatically control the output. The power is then distributed through a system of manifolds to the various departments.

Compressed air is furnished by a 300 H.P. two-stage, inter-cooled compressor, directly connected to a compound Corliss engine. Provision is made for adding more when required. The compressor delivers through a receiver to the mains at a pressure of 100 lbs. per square inch.

The fresh and salt water systems distribute through the manifolds throughout the plant, the former direct from the Spring Valley mains, the latter from a 16x9x12 in. Smith-Vaile fire pump, which will deliver 750 gallons per minute. This is governed by a Metz pump governor, so that it keeps a constant pressure on the mains. As the salt water is also used for condensing and for sprinkling the grounds, the pump is constantly in operation, thus being ready at all times for emergencies. By a system of valves the fire pumps can be changed over to the fresh water system if necessary, or in case of fire will operate both until the arrival of the city's engines, when the latter will take fresh water, leaving the salt water system for the shop force. There is also in the power house a 100 H.P. induction motor driving a line shaft which operates a blower for the blacksmith shop fires, an auxiliary air compressor and an auxiliary hydraulic pump.



Interior of boiler shop, Risdon Iron Works, San Francisco.

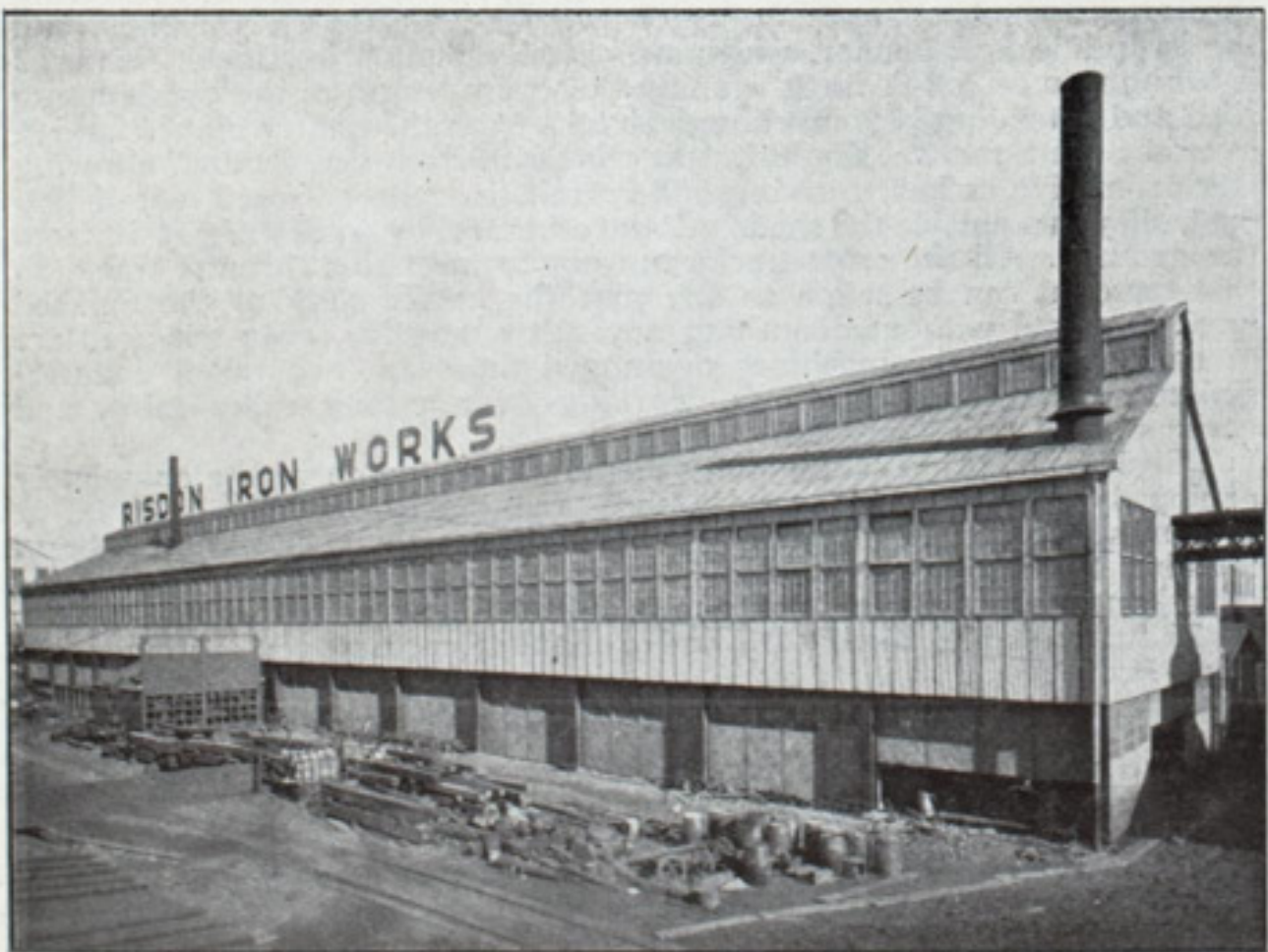
OIL SYSTEM.

The oil system is very complete, crude petroleum being the principal fuel through the works. The storage tank holds 7,000 barrels and is surrounded by a brick wall 60 by 55 ft., 9 ft. high, forming a reservoir with cemented floor which will contain the entire contents of the tank. One corner is walled off, forming a pumping room. Here is located a Gould's rotary pump, operated by a 5 H.P. motor and having a capacity of 250 gallons per minute. This is connected to the pipe lines so as to be used either to empty tank cars into the storage tank or pump oil into the supply tank at the power house. It will empty a car in twenty-five minutes or fill the storage tank (which will last about ten hours) in fifteen minutes. Four cars can be connected to it at one time. The supply tank is buried beneath one end of the power house. Above this are two duplex steam pumps arranged in duplicate. These pump the oil through a heater to the boilers. They also pump oil to the blacksmith and boiler shops, where it is used in the angle furnace, rivet heating furnaces and other fires.

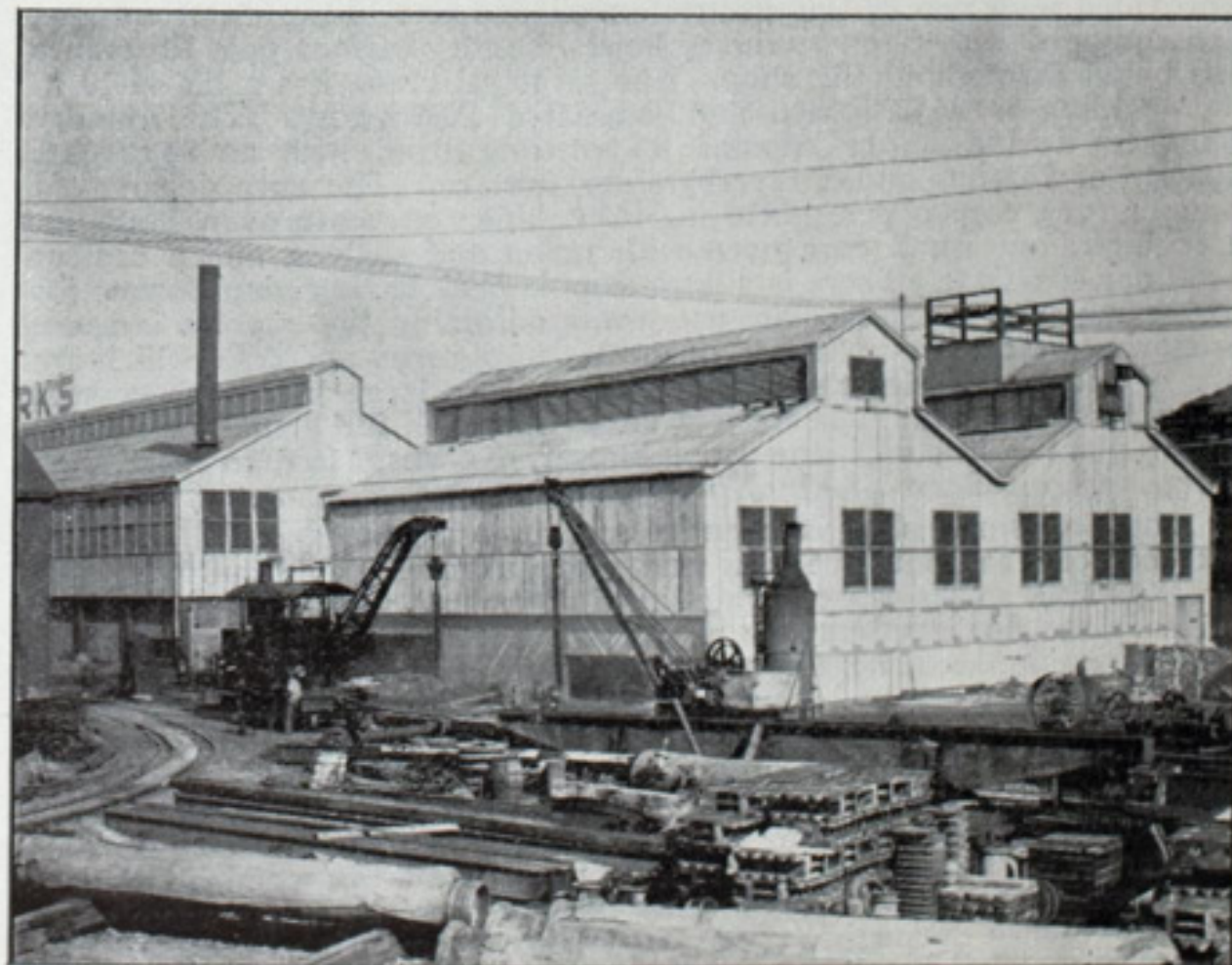
MACHINE AND BOILER SHOPS.

The machine shop is a carefully-designed steel structure, 400 by 110 ft., is unusually lofty for such buildings, and is elaborately lighted and ventilated. The tools have been carefully chosen to properly handle the heaviest marine and mining machinery as well as the finest and most accurate machine work. They were supplied by the Bement-Miles Co. of Philadelphia, and there is no machine shop in the country that contains larger tools or a more complete equipment. All large new tools have their own direct-connected motor. Among these are 24x16-ft. vertical boring mill, four 8-ft. vertical boring mills, a horizontal boring and milling machine of 14 ft. horizontal travel by 8 ft. vertical travel, a 60x40 heavy forge lathe, two large vertical planers and many others. In fact, the shop is fully equipped with new tools throughout.

Above the ground floor are two galleries on each side of the building. The lower galleries are each 125 by 25 ft., extending from the north end. The upper galleries are of the same width, extending the full length of the building. The lower ones are filled with small tools, vise benches, etc., as is the east upper gallery, the west being at present occupied by the electrical storeroom and workshop, the office and the temporary draughting room of the works. In the remaining 275 ft. not occupied by the lower galleries (that is, the south or erecting end) run two 10 and 15-ton electric overhead traveling cranes of 25 ft. span and 22 ft. lift. In the middle 50 ft., which is clear to the roof, runs a 20-ton crane the full



Exterior of blacksmith shop, Risdon Iron Works, San Francisco.



Exterior of power house, Risdon Iron Works, San Francisco.

length of the building. It has a lift of 30 ft. Besides these a 60-ton crane of the same type is to be installed in the south end, where the erecting shop is located. It will be above the 20-ton crane and will have 50 ft. span, 45 ft. lift and a 275 ft. run. The 15, 20, and 60-ton cranes all have 5-ton auxiliary hoists. The ground floor is paved throughout with red-wood blocks, set on end in asphalt and coated over with tar and gravel. The machine shop tool room is built into one side of the main building about midway in length. It is 30x60 ft., two stories high, encased on three sides, with the fourth separated from the main shop by wire netting only. It contains a complete equipment of the finest machines for making tools and a large assortment on hand of all the tools necessary for a modern shop.

The boiler shop and foundry adjoin end-to-end, allowing space through the partition for the railroad track which runs through the boiler shop close to this partition and serves as an outlet for both. The shop is a thoroughly substantial, high, well-lighted building, 250x184 ft. It also is paved with wooden blocks. Adjoining is the foreman's office, 14x14½ ft., raised 8 ft. above the floor and so situated as to command a view of the entire shop. A tool-room 61x14½ ft. is situated under and to one side of the office. It is separated from the shop by wire netting, the other three sides being cased in. There is also a room of 45x30 ft. fitted with racks for bolts and rivets. The main shop has three overhead electric traveling cranes, one 60-ton with 56 ft. span and 41 ft. lift; one 20-ton with 50 ft. span and 41 ft. lift; one 10-ton with 33½ ft. span and 30 ft. lift. All have 5-ton auxiliary hoists.

The tool equipment consists of bending rolls, hydraulic flanging presses, hydraulic riveters, air riveters, punches and shears, pneumatic hammers, and in short everything to make up a modern boiler shop is provided. Among the principal machines are a large punch with 60 in.



Exterior of machine shop, Risdon Iron Works, San Francisco.

jaw, capable of punching a 6-in. hole in a ⅝-in. plate. Here are also located rolls of 12 ft. 6 in. capable of rolling a 1¼-in. plate. There is a gang drill for drilling large boilers, on which three men can operate at one time; large flange punch for punching heads, the latest improved pattern. Besides there are drills of all sizes and kinds, the latest improved types of bevel angle and plate shears, post jib cranes with hydraulic hoists, hydraulic flanging clamps and bending machines, bending slabs, five forges, rivet-heating furnaces, etc. Outside the building and alongside the railroad tracks are the plate racks and also tube racks 60 ft. long by 80 ft. high. Air is furnished the forges by a No. 8 Sturtevant steel pressure blower belted to the line shaft.

FOUNDRY, BLACKSMITH SHOP, ETC.

The foundry is a steel building covering an area of 250x200 ft. It is provided with two 30-ton electric cranes and one 10-ton electric crane, each equipped with 5-ton auxiliary hoists, besides various post jib cranes distributed throughout the shop. The principal crane has a lift of 40 ft. The building is well lighted and ventilated throughout. The foundry equipment includes four cupolas for melting iron, with an aggregate capacity of 75 tons and a reverberatory furnace. The core department contains four core ovens, 12x18 ft., 14 ft. high; one core oven 18x25 ft., 14 ft. high; one small core oven with turret and shelves, and a cement core floor 40x100 ft. There is a large cupola deck having ample space for storing material for immediate use, while adjoining the cupolas is room for storing practically unlimited quantities of pig iron and coke which are easy of access. Under the cupola platform are large bins with cement floor for storing loam. There is a large Chili mill for loam work. The blower plant consists of one Root blower, No. 6, geared to a 30 H.P. motor, and one Root blower, No. 5, geared to a 20 H.P. motor.

The blacksmith shop is intended and designed to handle all work of that character for both machine and ship purposes. The building is of steel 350x65 ft. and is especially designed as regards ventilation. The sides and ends are made up entirely of sliding doors, which can be moved in either direction, securing a cool shop in the hottest weather and allowing large pieces of work to be swung in easily or carried out at any point. The following are among the tools included: Hydraulic press for making and welding bands and for drop forging; electric bevelling machine for angle iron; 3-ton steam hammer; 2-ton steam hammer; 1-ton steam hammer; 1,500-lb. steam hammer; two 1,100-lb. steam hammers; one bolt hammer; two 20-ton steam jib cranes; two 10 and 6-ton wood jib cranes; one 10-ton steel jib crane; one forging furnace from which the waste gases are utilized in a steam boiler for supplying steam to the cranes. This shop also contains bending slabs 45x45 ft.; has a full equipment for forging cranks and heavy shafting, ship-smithing, machine forgings, etc.

There is room for forty-five fires arranged along the center and on either side.

The pipe shop immediately joins the boiler shop on the opposite end from the foundry and extends north to the power house and copper shop. These form the ends, the sides being open. The roof covers a space of 133x186 ft., which is not excessive when we take into consideration the fact that the Risdon Iron Works makes more sheet pipe than any other single firm in the world. This shop is also used extensively for doing light pipe work, making smoke-stacks, dredger buckets, etc. Narrow-gauge tracks connect it with the boiler shop.

SHIP TOOL BUILDING.

The mold loft and ship tool building has been very carefully designed. It is of steel 433 ft. long by 85 ft. wide, with an additional 15 ft. of overhanging shed running the full length. This side is open, the columns being 40 ft. apart and facing the shoreward ends of the ship building ways. The mold loft floor, having a perfectly clear expanse of 433x85 ft., is probably the largest in America. Being supported every 10 ft. by latticed girders 5 ft. deep, it is practically rigid. The most noticeable feature of the ship tool shop is the elaborate system of trolleys and crawls for distributing material and handling it at the machines. There are twenty-four crawls, ranging from 6 ft. to 17 ft. span and supplied with cross-trolleys for handling plates and angles; nine 3-ft. gauge trolleys running on the through tracks for distributing material, and two narrow gauge trolleys for handling angle bars at the double-angle shears and angle planer. This shop is completely equipped with new tools throughout. Among the larger ones is a plate bending roll of 30 ft. 2 in. operated by a 35 H.P. A.C. motor, and a 15 H.P. A.C. motor for raising and lowering the top roll; a hydraulic keel-plate bender 24 ft. 8 in. long, 8 ft.



Exterior of ship shed and molding loft, Risdon Iron Works, San Francisco.

wide, taking 4 in. material; a 48-in. heavy combined punch and shear, motor driven; a 42-in. heavy double punch, motor driven; a 36-in. heavy combined punch and shear, motor driven, and six smaller single belt-driven punches or shears; a set of mast bending rolls, 12 ft. 2 in. wide, motor driven; a set of straightening rolls, 86 in. below housing, motor driven; an angle-iron planer for any length and any degree of straightness; two plate planers 30 ft. long, motor driven, and fitted with hydraulic clamping jacks; a large combined horizontal punch and beam bender; a medium sized horizontal punch, radial countersinkers, drill presses, etc., over which are two lines of track carrying twelve crawls of 11 ft. span each. Completely around these runs a through track carrying four 3-ft. trolleys for distribution. Just outside this oval are tracks of 6-ft gauge for the four small single-ended punches or shears and the two 30-ft. plate planers; 13-ft. gauge tracks for the mast rolls and straightening rolls; and clear across one end are two 17-ft. gauge tracks completely covering the large 30-ft. bending rolls, which will take a plate 2½ in. thick, and the hydraulic keel bender, which will bend a plate 4 in. thick. Material is brought in on a 3-ft. track running the entire length of the overhanging shed and extending beyond enough to take from the gantry crane running over the plate racks. The 3-ft. track is 20 ft. from the ground, allowing the locomotive cranes to swing underneath the railroad track, paralleling the trolley just outside the shed. All the other trolley tracks are 14 ft. from the ground. All the cross-tracks run out to meet this through track, so that material can be taken to any machine in the shop or the finished work removed without disturbing any other machine, even when all are in use. Besides the machines mentioned there are two radial counter-sinking and drilling machines, working over a long roller table, and various smaller drill presses.

Besides the principal buildings mentioned above, there is a completely equipped joiner and ship pattern shop, two stories high, 200x100 ft., at present supplying all the pattern work; a copper shop, 110x45 ft.; a brass foundry, 80x110 ft.; a two-story pattern storage warehouse, 80x170 ft.; miscellaneous warehouses aggregating 132x200 ft.; an emergency hospital, 23x75 ft.; a stable, 35x123 ft., and a Babbitt melting and fitting shop, 16x25 ft.

WATER FRONT, SHIP YARD WAYS, ETC.

The wharfage facilities include nine wharves, with frontage as follows: No. 1, 387 ft. long; No. 2, 300 ft.; No. 3, 48 ft.; No. 4, 300 ft.; No. 5, 138 ft.; No. 6, 235 ft.; No. 7, 43 ft.; No. 8, 300 ft.; No. 9, 150 ft. The total frontage is 1,900 ft. All are connected by railroad tracks and have hydraulic, compressed air and electric connection with the power house, besides salt and fresh water plugs.

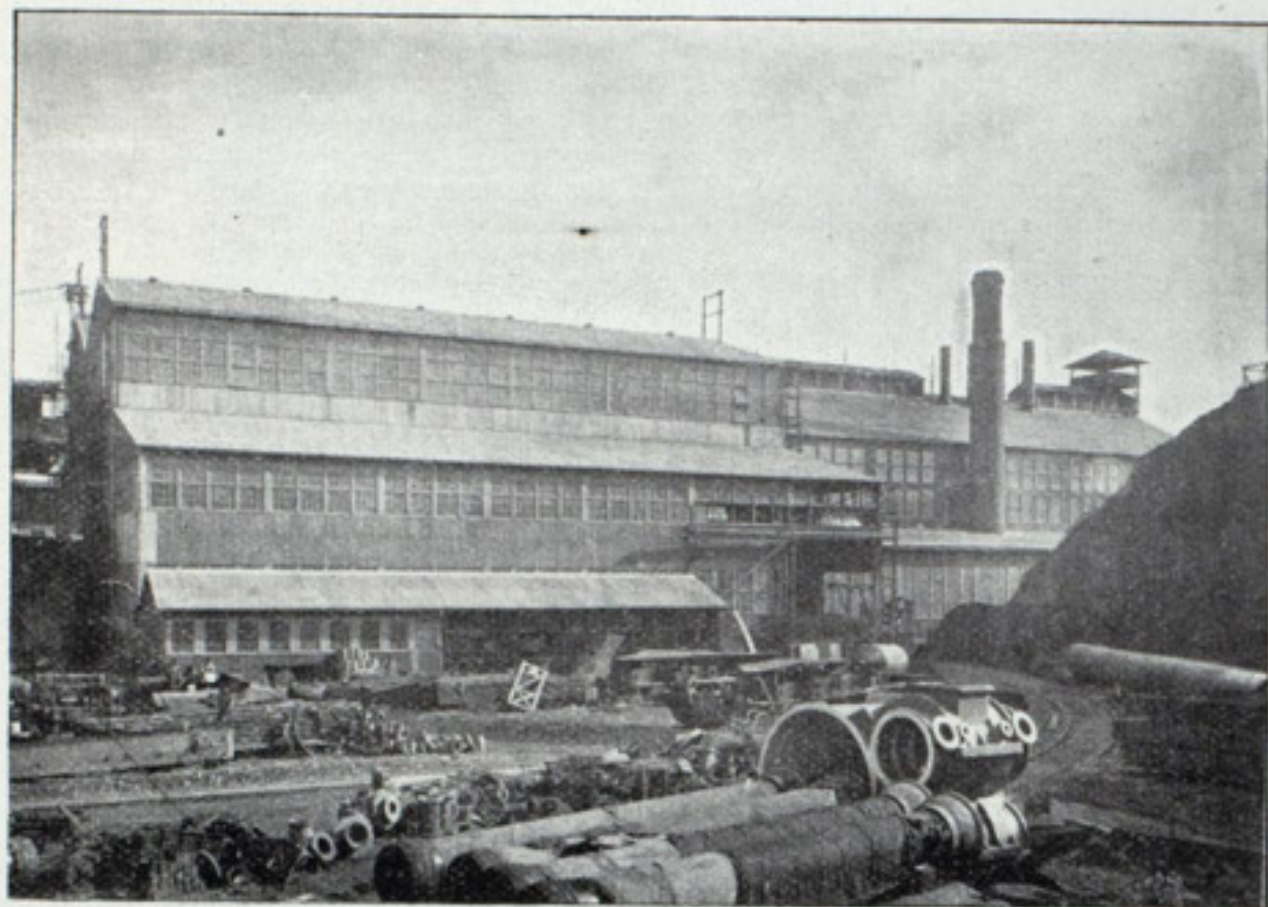
The 100-ton shear legs are located on wharf No. 1. Besides the main lift of 100 tons, there is a masting hoist of 20 tons capacity. The shear

legs have an overhang of 36 ft., a spread of 45 ft., and a clear lift of 90 ft. There is room at present for building five vessels 600 ft. long and one 700 ft. long, or a greater number of smaller vessels occupying the same length. Provision is made for handling all material in the course of construction by overhead traveling cranes. These cranes are located along the ship ways, extending up to the blacksmith shop and the ship tool building. They will be covered by a gantry crane, with a span of 60 ft., running their entire length and delivering material to either the blacksmith shop or the trolleys of the ship tool building. Railroad tracks pass through them, underneath the gantry, which will be high enough to allow the locomotive cranes to pass underneath.

The Risdon Iron Works is well supplied with launches, having three operated by gasoline for service between the Potrero works and the down-town office and branch. They are 55 ft., 50 ft. and 36 ft. long, respectively, and are very swift, the largest being equal in speed to anything on the bay of the same dimensions.

The total ground owned is 35 acres, while the aggregate area under cover at present is approximately eight acres with another acre provided for in the near future. This leaves 26 acres for ship yard, storage and future expansion. The total floor area, with what is provided for, amounts to 10½ acres.

The new city office and branch machine shop is a handsome building located at the corner of Steuart and Folsom streets, near the Folsom



Exterior view, boiler shop, Risdon Iron Works, San Francisco, Cal.

street wharf. It contains a storeroom for made-up stock, an exhibition of sample machines and a small shop for hurried repairs and other work of similar nature.

GROWTH OF THE RISDON WORKS.

The Risdon Iron & Locomotive Works, though entering upon a remarkable era of expansion, so extensive and divergent that the old landmarks of its development are quite lost sight of, is yet one of the oldest and best established manufacturing institutions on the Pacific coast. In the early days, when mining was the prime source of wealth on this coast, its machinery was the most important manufactured. The Risdon being a pioneer in this field, has grown up with it, expanding as it developed and contributing its full quota of original inventions, improved forms and labor-saving devices, which have made California's methods a model of mining on a large scale as a practical science the world over. Though this will always remain an extensive and lucrative field, other lines are developing into even greater magnitude—ship building, for instance. The work which this company is now prepared to do lies in five broad fields, each complete in all its branches. They are ship building, marine engineering, mining machinery, structural iron work and miscellaneous engine and machine work.

In ship building the equipment is entirely new and up-to-date and includes facilities for building six steel vessels at once, 600 or 700 ft. long and up to 80 ft. beam, or a larger number of smaller vessels. There are also provided nine wharves for the repair and fitting out of steamers.

The second department is that of marine engines, high pressure, condensing, compound, triple or quadruple-expansion; marine boilers of the latest improved Scotch, locomotive type or water-tube, for burning either coal or crude petroleum; condensers, feed pumps, distilling apparatus, evaporators, refrigerating and ice machines, steering engines, windlasses, winches, coal and ash handling machinery, and in fact all that goes to operate an ocean-going steamer of the largest and most elaborate type.

The third or mining machinery class is so broad that only a bare mention can be made of the various types. For mining proper there are hoisting and pumping engines, steam, hydraulic and portable, and rock-drilling, tramway and ventilating machinery. For ore reduction there are smelting furnaces for silver, lead and copper, reverberatory and mechanical roasting furnaces, revolving and kiln ore dryers, stamp mills, roller mills, concentrators, and chlorination works. Among the specialties in this line manufactured by the Risdon are Bryan roller mills, Johnston concentrators, steel whims, Hoskin's giants, Wright calcining furnaces, Pelatan-Clerici process machinery and Evans' hydraulic elevators. Among the different methods of mining, one in particular has become of paramount importance in the last few years. It is working the gold-bearing river beds by means of bucket and even caisson dredgers.

The Risdon has built a great number of those and holds the exclusive rights for building the R. H. Postlethwait dredge, undoubtedly the most successful one on the market. As evidence of this might be stated the fact that four years ago there was no successful dredger working in California, although many were left as failures on the banks of rivers through-

out the state. Since the first Risdon dredger was built on the Feather river there have been over thirty of them made, and the Risdon is now building nine of these machines. The dredgers have not only been used in California, but are in operation all over the western states and among the gold districts of Africa, Alaska and Mexico.

In the fourth class, that of structural iron and steel work, the Risdon has contributed to the most important recent building operations of San Francisco, notably the Union depot, or Ferry building, and the Claus Spreckels building. Mention should also be made of the Spreckels Sugar Co.'s plant at Spreckels, Monterey county, California. The main building is 582 ft. by 103 ft., six stories high, and contains over 3,600 tons of structural steel.

The last class, comprising miscellaneous engine and machine work, contains many diverse branches, some—notably sugar machinery and hydraulic machinery—being almost of sufficient importance and magnitude to rank with the main groups. The former includes most of the machinery used on the sugar plantations of the Hawaiian islands, consisting of crushers, vacuum pans, filter presses, settling tanks, etc., besides engines, trash burning boilers, pumps, water wheels, motors, etc. In hydraulic machinery the Risdon is a pioneer, having built the real prototype of the modern tangential water wheel with re-action buckets, frequently called the "Pelton type" water wheel. They have built these extensively for many years, the later examples being three 3,000 H.P. water wheels directly connected to polyphase alternators for the Bay Counties Power Co. Another important branch is that of hydraulic steel pipe building, of



Portion of ship joiner shop, Risdon Iron Works, San Francisco.

which they are the most extensive builders in the world. The miscellaneous group is too extensive and diversified to allow of specifying more than a few types. For instance, Corliss engines, Risdon air compressors, Heine safety water-tube boilers, Smith-Vaile pumps, all sorts of manufacturing and special machinery, boiler fixtures, all kinds and sizes of valves, pneumatic and hydraulic tools, etc.

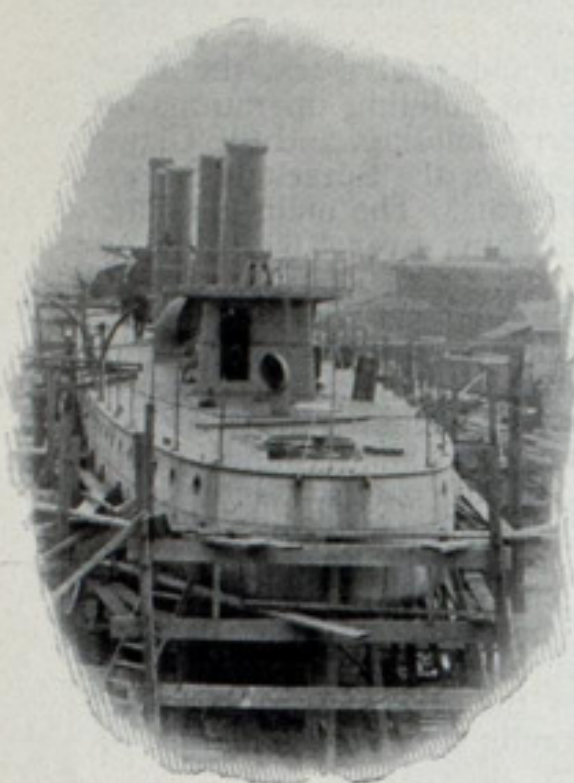
Secures a Coal Supply.

Mr. E. H. Gary, chairman of the board of the United States Steel Corporation, has made the following statement relative to the operations of the Pocahontas coal syndicate, showing that provision has been made for the needs of the United States Steel Corporation in the transfer of the syndicate's coal properties to the Norfolk & Western Railway Co.:

"The properties heretofore secured by the managers of the Pocahontas coal syndicate, consisting of about 300,000 acres of the very best fuel and coking coal which has ever been discovered, and located on the lines of the Norfolk & Western Railway Co., have been sold and conveyed to the Pocahontas Coal & Coke Co., whose capital stock is owned or controlled by the said railway company, and 50,000 acres of these lands have been leased, on a royalty basis, to companies whose capital stock is owned or controlled by the United States Steel Corporation. There will, within the comparatively near future, be constructed at least 3,000 of the most modern coke ovens, with a capacity of at least 1,500,000 tons of coke, together with necessary railroads, tipples, water works, electric plants, power plants, residences, stores and other improvements; and work will be begun at once. It is expected the consummation of these transactions will result in great benefit to the Norfolk & Western Railway Co. and to the interests of the United States Steel Corporation. Although the royalties are small, they are largely in excess, per acre, of the purchase price, with interest; so that the business of the coal company should be very profitable; and the freight receipts for transporting the coke to be produced, as well as a large tonnage of coal for fuel, should furnish a very large and steady and increasing income to the railway company. The companies controlled by the United States Steel Corporation have by this lease secured, at a low royalty charge, sufficient coal of the best character and quality to provide, on the present basis of consumption, for about thirty years. This, with the Connellsville coal now owned, will, on the same basis, furnish the necessary supply of coke for upward of sixty years; and it now corresponds with the iron ore supply. Pocahontas coal is very high in carbon, of good physical structure for coke, practically smokeless, and the demand for this coal, for fuel and coke both, has been steadily growing, and at present greatly exceeds the supply."

It is learned from authoritative sources that payment for the properties sold by the syndicate is to be made by a joint issue by the Norfolk & Western Railway Co. and the Pocahontas Coal & Coke Co. of \$20,000,000 4 per cent. bonds guaranteed by the Pennsylvania Railroad Co.

THE HARLAN & HOLLINGSWORTH CO., WILMINGTON, DELAWARE.



Torpedo Boat Destroyer Hull on the Stocks.



THE Harlan & Hollingsworth Co., Wilmington, Del., has enjoyed of late a long period of unusual prosperity and has a great deal of work ahead of it. The plant of this company covers an area of seventy-six acres and embraces forty-seven buildings in all. It has a water frontage on both sides of the Christiana river for several blocks. Included in the works is a Simpson's patent sectional basin dry dock for docking vessels up to 340 ft. length. The railway system throughout the works today aggregates 7 miles, with many cars and two locomotives. The ship yard is equipped with every modern appliance including the latest pneumatic tools. There are seven sets of building ways in the ship yard. The company has in no instance experienced an accident during a launch in its whole career. A brief review of the work done during the year is as follows:

The company built a steel twin-screw steam yacht for Charles Fletcher of Providence, R. I., the general dimensions of which are as follows: Length

along rail line (top of waist), 212 ft.; length on water line, 176 ft.; molded breadth, 25 ft. 11 in.; depth from top of keel to top of deck beams at center, 16 ft. 9 in.; speed, 14 knots; built under Lloyds rules. The yacht is equipped with triple-expansion engines that have cylinders of 13, 21½ and 35 in. diameter with stroke of 22 in. She has two Scotch boilers, 13 ft. diameter and 10 ft. 6 in. long, built for 185 lbs. steam pressure. The vessel has clipper stem and square stern with one continuous deck house. On the forward end of the main deck there is a fore-castle deck, upon which there is a crew's galley, lamp room, laundry, crew's mess, firemen's quarters, crew's lavatories and steam windlass. Above the main deck there is a chart house and captain's stateroom of teak. The top of the chart house is used as a navigating bridge with light bridge extending to side of vessel. The yacht is rigged as a two-masted schooner. Accommodations for crew and officers are forward on the cabin deck. The owner's quarters are forward and aft on cabin deck. The dining room is in the forward end of the house followed aft by pantry, owner's galley, a drying room and closet. The after part of the house contains a library and stateroom.

This company also built a dredge hull for H. T. Dunbar of Buffalo, N. Y., of the following dimensions: Length over all, 100 ft.; width, 32 ft.; depth, 8 ft. 9 in. The machinery was supplied by the owner.

The ferry boat Cape May for the Philadelphia & Reading Railway Co., operating between Philadelphia and Camden, N. J., was finished during the year. Her dimensions are: Length over all, 169 ft.; beam, molded, 30 ft.; beam over all, 55 ft. 6 in.; depth of hold, 13 ft.; engine, jet condensing, beam, cylinder 44 in., stroke 10 ft.; side wheel, diameter over buckets 19 ft. and face of bucket, 7 ft. 3 in. She has one direct tubular boiler designed for a working pressure of 55 lbs.; diameter of shell, 9 ft. 9 in.; width of front, 13 ft.; length over all, 25 ft. 6 in.

Two ferry boats, the Bound Brook and Lakewood, were completed

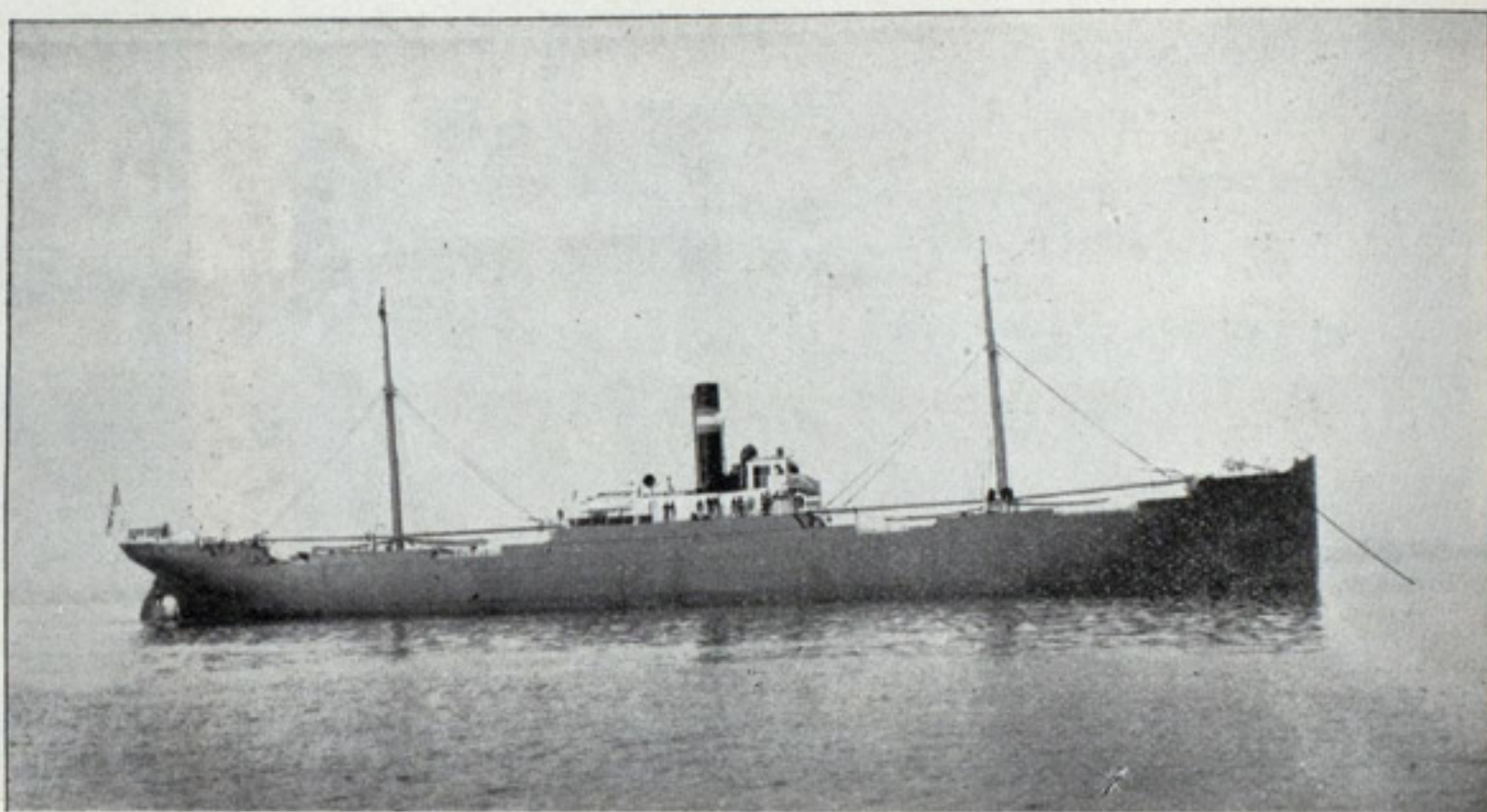
stroke. Each of the three boilers is 8 ft. 9 in. in diameter and 20 ft. long, built for 170 lbs. working pressure.

The steamship Denver, built for the New York & Texas Steamship Co., has already been thoroughly described and illustrated in the Review. She is a freight and passenger steamer of the following dimensions: Length over all, 386 ft.; beam molded, 48 ft.; depth to main deck, 26 ft.; Length to awning deck, 35 ft.; speed, 16 knots. The engine is direct-acting triple-expansion with cylinders of 33½, 54 and 87 in. diameter by 54 in. stroke. The boilers are four in number and of the Scotch type, 16 ft. 3 in. in diameter and 11 ft. 6 in. long.

A tramp steamer, the Pathfinder, was built for Messrs. Henry T. Knowlton and Amos D. Carver of New York. She is 321 ft. over all, 44 ft. 11 in. beam and 23 ft. deep. She has a cellular double bottom, all-fore-and-aft. She has two steel pole masts, each fitted with four cargo derricks and complete set of leg of mutton sails. There are five water-tight bulkheads. Her engines are triple-expansion, surface condensing, 23, 38 and 62 in. diameter with stroke of 42 in. There are two Scotch boilers, 15 ft. diameter and 10 ft. 6 in. long, designed for 170 lbs. steam.

The vessels now under construction, or for which contracts have been received, are as follows:

Steamer Brandon for the Old Dominion Steamship Co. of New York. Dimensions: Length over all, 213 ft.; beam molded to under side of beams, 37 ft.; beam over guards, 43 ft.; depth molded to top of beams, 17 ft. 3 in. Machinery—Inverted, triple-expansion, surface condensing, three-cylinder engine, 18, 28 and 45 in. cylinder diameters by 30 in. stroke. Boilers—Two of Scotch type, 12 ft. 9 in. in diameter and 10 ft. 6 in. long, to be built for 170 lbs. steam.



THE TRAMP STEAMER PATHFINDER, OWNED BY MESSRS. HENRY T. KNOWLTON AND AMOS D. CARVER OF NEW YORK.
Built by the Harlan & Hollingsworth Co., Wilmington, Del.

Ferry boat for the Riverside & Fort Lee Ferry Co. of New York of the following dimensions: Length over all, 180 ft. 8 in.; length between sternposts inside, 146 ft. 6 in.; beam molded at deck, 39 ft. 9¼ in.; beam over all, 60 ft.; depth, molded, 15 ft. 6 in. Engines—Inverted, direct-acting, three-cylinder compound type, 22, 30 and 30 in. cylinders with stroke of 24 in.; two marine type fire tube boilers, each 10 ft. 6 in. diameter and 11 ft. 6 in. long. This is a double-deck vessel and is intended to be one of the handsomest in the country.

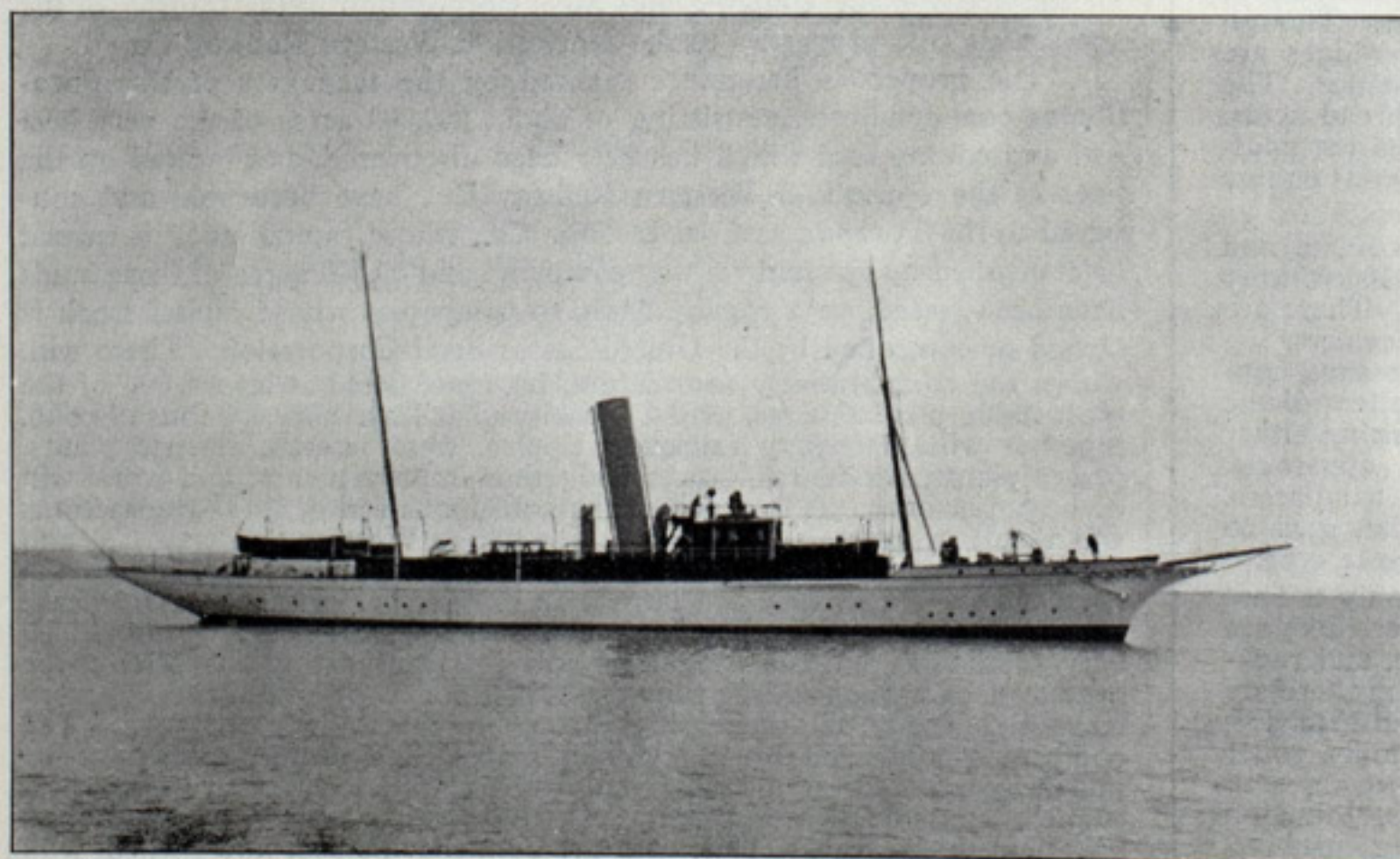
Hull of side-wheel steamboat of steel for the W. & A. Fletcher Co. of Hoboken, N. J., for service on Lake George, N. Y. To be known as the Sagamore. This vessel is to be constructed complete, then taken apart and shipped in sections and re-erected at destination. Length over all, 203 ft. 4 in.; beam, molded, 30 ft.; beam over guard fenders, 54 ft. 4 in.; depth, molded, 10 ft. 6 in. The company furnishes the hull only.

In addition to the above the company has contracts on hand for a duplicate of the ferry boats Lakewood and Bound Brook and also for a side-wheel passenger and freight steamer for the Bridgeport Steamboat Co. for service on Long Island sound. Dimensions: Length over all, 257 ft.; beam at water line, 36.10 ft.; depth, molded, 14 ft. 6 in. Engines—Inclined-compound, surface-condensing, paddle-wheel, with cylinders of 35 in. and 72 in. and stroke in both pistons of 72 in. There will be four Scotch boilers, 12 ft. in diameter and 10 ft. 6 in. long. This vessel will be known as the William G. Payne.

The company also has under contract a steel auxiliary schooner yacht for Tams, Lemoine & Crane of New York of the following dimensions: Length on water line, 110 ft.; length over all, 131 ft.; beam, molded, 26 ft.; depth to upper deck at side, 19 ft.; compound engine, 8 and 16-in. cylinders, with 12 in. stroke; two Almy class D water-tube boilers designed for a pressure of 250 lbs.

Also a steel side-wheel steamboat for the Baltimore, Chesapeake & Atlantic Railway of the following dimensions: Length between perpendiculars, 180 ft.; beam, molded, 34 ft.; depth to main deck at side, 10 ft.; beam engine, 38 in. cylinder by 9 ft. stroke; one wagon-top boiler, 17 ft. 3 in. diameter and 16 ft. long. This vessel is designed for freight and passenger service on Chesapeake bay.

The company has under way the torpedo boat destroyers Hopkins and Hull and torpedo boat Stringham for the United States navy. A great deal of repair work is also on hand.



TWIN-SCREW, STEEL STEAM YACHT OWNED BY MR. CHARLES FLETCHER, PROVIDENCE, R. I.
Built by the Harlan & Hollingsworth Co., Wilmington, Del.

for the Central Railroad Co. of New Jersey. They have one screw at each end with two cabins on the main deck and two horse-ways between. Their dimensions are: Length between propeller posts, 176 ft.; length over guards, 207 ft.; beam, molded, 44 ft.; breadth over guards, 65 ft.; depth, molded, 17 ft. 3 in. Engines are of the inverted direct-acting triple-expansion type, with four cylinders, 19, 30, 35 and 35 in. diameter by 30 in.



Photograph copyrighted, 1901, by Enrique Muller, 714 Monroe st., Brooklyn, N. Y.

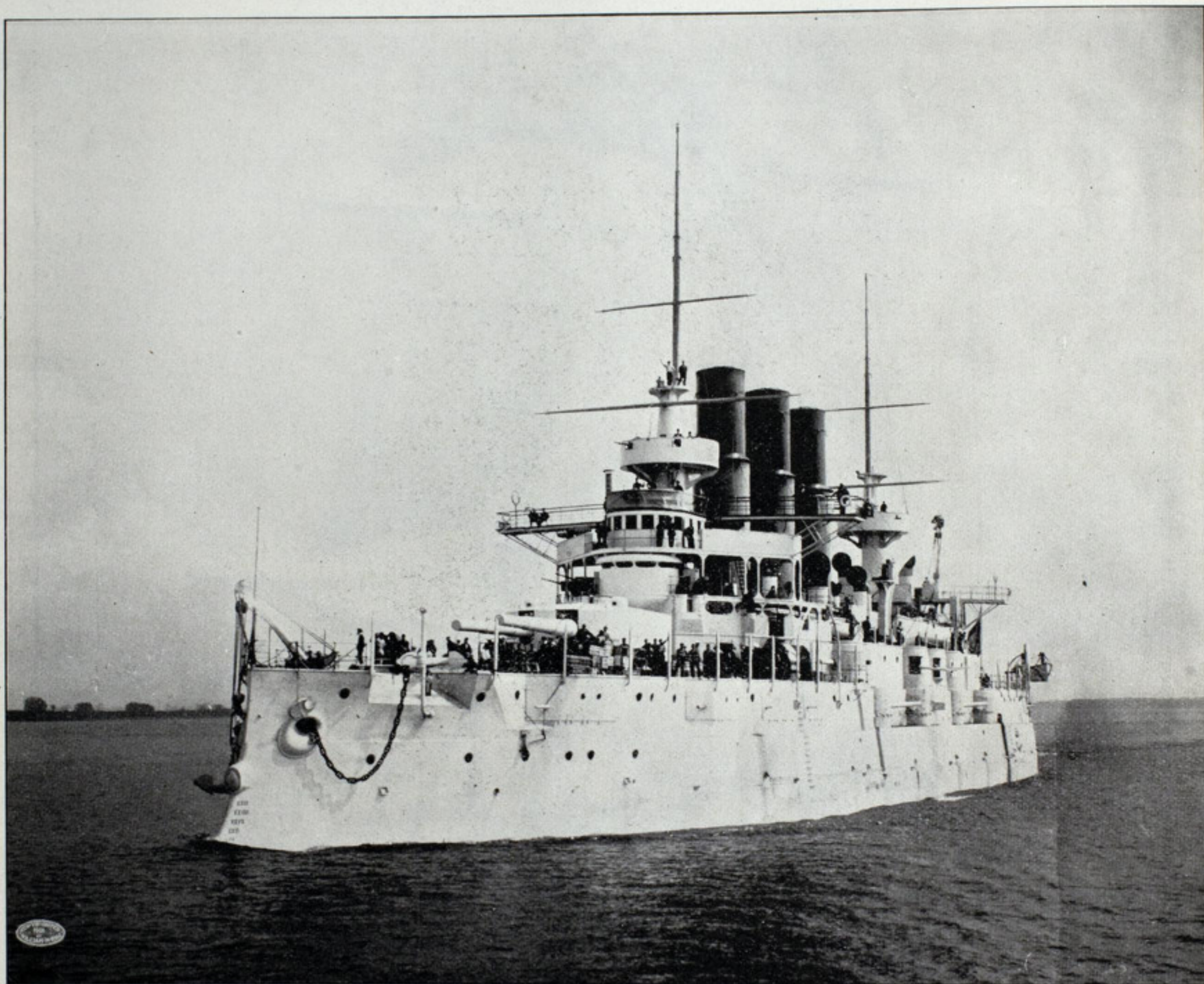
Admiral Farragut's old flagship, the Hartford, as she appears today. She has been practically rebuilt and is now used as a training ship by the United States Navy.

THE CRAMP-BUILT RUSSIAN BATTLESHIP RETVIZAN.



RUSSIA'S new battleship, the Retvizan, possesses a special interest because she is the first important foreign battleship to be constructed in an American ship yard. The first foreign orders for warships of the modern type were those given by the Japanese government to the Union Iron Works of San Francisco and the William Cramp & Sons Ship & Engine Building Co. of Philadelphia for two high-speed cruisers. Both of these vessels have been built and delivered and each of them considerably exceeded the contract speed. Following closely upon the trial of these vessels an order was placed by the Russian government at Cramp's works for a battleship and cruiser. The latter, the Variag, had her trial in 1900 and achieved a speed of 24.6 knots per hour, thus ranking her as one of

showed that a radius of 8,800 knots was obtained with 2,000 tons of coal, which is about the full capacity of her bunkers. This trial was made with only the after group of eight boilers in use, and besides the steam used for the main engines, power was furnished for all the electric machinery and auxiliaries of every kind and the evaporators were also used to make up the fresh water loss. Another trial to determine the most economical coal consumption was made at the termination of the 10-knot trial. For this a speed of about 100 revolutions of the engine was taken, using all the boilers with slow combustion. This trial determined that the amount of coal per horse power per hour at this speed was 1.55 lbs., the engine developing 7,820 H. P. Several minor tests were made during the trial. One was of the evaporators, which developed a capacity 30 per cent.



Built by the Cramps, Philadelphia.

RUSSIAN BATTLESHIP RETVIZAN.

Photograph copyrighted by William H. Rau, Philadelphia.

the very fastest vessels of her kind in the world. The battleship has undergone her builder's trial, on which she attained an average speed on a twelve hours' trial of 18.18 knots. This speed was made on the run from the Capes of the Delaware to Boston. After the screw standardization runs at 18 knots over the measured course, for which it was ascertained that 125.47 revolutions per minute were required, the vessel returned to Philadelphia. Continuing on the twelve-hour test, after leaving the measured course on her return to the Capes the average number of revolutions for the entire twelve-hour run was 124.9. This reduction in speed was caused by the giving out of a faulty tube of No. 11 boiler, which boiler was out of use for three hours. In that relatively short space of time the fire was drawn from the disabled boiler, the faulty tube replaced and the boiler connected. Before and after this occurrence the engine was keeping up the average number of revolutions made over the measured course. During the last hour of the twelve-hour trial an account of coal burned was kept. When the engines were developing 18,300 H. P. the consumption with the auxiliaries amounted to 1.8 lbs. per horse power per hour. During this trial the boilers steamed freely and although the blowers were running there was no air pressure shown by the gages. The blowers assisted only by drawing the air down to the furnace level. The engines worked remarkably well, with no jar and no heated bearings, every part, including auxiliaries, working smoothly.

As soon as the twelve-hour test had been completed a trial of twenty-four hours at 10 knots was made to determine the radius of action at that speed. The amount of coal consumed during the twenty-four hour test

above what the contract called for. Then engines were also reversed from full speed ahead to full speed astern to the entire satisfaction of the Russian board. The Retvizan is a first-class battleship of 12,700 tons displacement. Her dimensions and leading particulars are: Length, 374 ft; breadth, 72.2 ft.; draught, 25 ft.; battery, four 12-in., twelve 6-in., twenty 3-in., twenty 3-pounders and six 1-pounders. The Retvizan is protected by a belt of armor of 9 in. thickness which extends from 4 ft. below the water line to 3 ft. above, reaching the level of the protective deck. The latter is 2 in. in thickness on the flat and 4 in. on the slopes. It commences to slope at the level of the top to the 9-in. belt and descends to a junction with the bottom of the belt below the water-line. The space between the slope and belt is occupied by coal bunkers. A projectile, before penetrating the engine or boiler rooms, would consequently have to penetrate 9 in. of Krupp steel, from 6 to 10 ft. of coal and 4 in. of sloping Krupp armor. The protective deck is carried the full length of the vessel and curves down to meet the stem and stern. At the stem it is merged into the framing of the ram bow, and being 3 in. in thickness and of turtle back form it gives enormous stiffness to the ram and would assist in transmitting the shock of ramming to the whole structure of the vessel. Above the 9-in. belt amidships and between the protective and gun decks is worked another belt of armor 6 in. in thickness. This will prevent rapid-fire shells from penetrating and bursting beneath the guns on the gun deck above. The bulk of the rapid-fire armament is carried on the gun deck. Amidships, above the 6-in. belt of armor, is a battery of eight 6-in. rapid-fire guns in casemates, each having a considerable train for-

ward and aft. The casements are protected by 5 in. of steel and the armor is carried athwartships at each end of the battery as a safeguard against raking fire. The 9-in. and 6-in. belts of armor are also carried athwartships to connect with the armor of the barbettes, thus forming a completely inclosed armored citadel amidships. At the four corners of the superstructure deck, above the central citadel, are four 6-in. rapid-fire guns, of which the forward pair can be trained dead ahead and the other two dead astern. These guns are completely protected with armor varying from 5 in. to 2 in. of steel. Forward of the central battery on the gun deck are four 3-in. rapid-fire guns, each with a protection of 2 to 3 in. of casement armor, while aft of the battery are six rapid-fire guns of the same caliber. The main deck is flush throughout the ship and is broken only by the amidship superstructure. Forward and aft of the superstructure are two elliptical balanced turrets, carrying 10 in. of Krupp steel. In each turret are placed two 12-in., 40-caliber, breech-loading rifles of the standard type manufactured by the Russian government. Both the turrets and the guns are operated electrically. The roof of the turret, which is of 3-in. Krupp steel, is slightly curved to clear the muzzles of the guns when the latter are elevated or depressed. There are twenty-six smaller guns mounted on the boat deck, the bridge and the fighting tops. Forward and aft on the boat deck there are distributed twelve 3-in. rapid-firers, while on the forward and after bridges, imme-

partments. Each group consists of four boilers, placed in pairs opposite each other, with a firing floor between; the remaining two boilers are placed facing either the forward or after bulkhead, as the case may be. The coal bunkers are between the boiler room and the ship's side, and extend the whole length of the boiler room and up to the protected deck. The stowage capacity of the bunkers is 2,200 tons, but the running capacity would be about 2,000. The boilers are connected to three smokestacks, eight boilers to each stack. The tops of these stacks are 100 ft. above the grate surface, and their diameter is 9 ft. 10 in.

The Pusey & Jones Co., Wilmington, Del.

A busy ship yard is that of the Pusey & Jones Co., Wilmington, Del. From a general machine shop employing ten men it has grown into a ship building plant employing from 700 to 1,000 men. Reference to the summary will show that the company has a great deal of work on hand. The plant at present covers seven acres of land with a wharf frontage of 1,400 ft. On the main wharf are immense four-leg lifting shears, with a lifting capacity of 100 tons. There are a dozen or more shops equipped with powerful tools and modern machinery, both electric and pneumatic. About 290 iron and steel vessels have been built in this yard and about 900 steam engines, for land and marine service, and the company has the



THE SAN FRANCISCO CLIPPER ST. DAVIDS. Photograph copyrighted by E. Muller, Brooklyn, N. Y.

diately above these, are eight others of the same caliber. These guns have a range of fire from dead ahead to abeam. There are also six 1-pounders in the two fighting tops. With such a numerous rapid-fire battery, a specially large supply of ammunition has to be carried, 2,400 rounds being supplied for the 6-in. guns alone. Three hundred and eight rounds are carried for the 12-in. guns. Electric ammunition hoists are installed throughout the ship.

The engines are two in number, located in water-tight compartments. They are triple-expansion. The cylinders are 38½, 59 and 92 in. in diameter, and the stroke is 42 in. When operating at 120 revolutions per minute the indicated horse power will be about 8,100 each, making a total of 16,200. Stevenson link-gear is used. The high-pressure cylinder is fitted with one piston valve, the intermediate with two, and the low-pressure cylinder with four. A separator of a centrifugal type is placed in the main steam line between the boilers and the engine-throttle valve. The condenser is of the surface type, with centrifugal circulating pump, and the Snow admiralty-type air pump. The discharge from the air pump passes through a sponge filter placed beneath the condenser, then into the hotwell. From the hotwell the water is taken by a vertical pump and forced up to a feed tank placed over the engines. From the feed tank the water passes by gravity through a closed heater to the suction line of the main boiler-feed pumps, which are located one in each stokehold on the starboard side. The auxiliary pumps are located on the port side, one being placed in each stokehold, as is the case with the main-feed pumps. In the discharge line of both the main and auxiliary-feed pumps is a grease extractor, consisting of filters of burlap or sacking material.

The boilers are twenty-four in number, with a heating surface of 2,222.64 sq. ft. each, making a total of 53,343.36 sq. ft. heating surface. The grate surface is 55.56 for each boiler, or a total of 1,333.58 sq. ft. The boilers are divided into groups of six, separated by water-tight com-

distinction of having built the first iron sailing vessel constructed in the United States, a speedy schooner named Mahlon Betts, launched in the year 1854. Another notable craft of its yards was the steel yacht Volunteer, the fastest sailing vessel in the world, and which a few years ago defended in the international races and kept on this side of the water the America's cup. The making of paper machinery is a feature of this company also.

Union Iron Works, San Francisco.

There has been little change in the plant of the Union Iron Works of San Francisco since the admirable description published of it in the last ship building number of the Review. New construction undertaken during the year includes two large armored cruisers, the California and South Dakota, contracts for which were made in January, and the large 9,800-ton, 22-knot protected cruiser Milwaukee; also three caissons, two for the Russian docks at Port Arthur and one for the new dock of the San Francisco Dry Dock Co. Several improvements have been made in the plant with a view to increased economy and superior workmanship. Five of the boilers supplying the works with steam have been put on California crude oil and have been found quite satisfactory. This oil is taken to San Francisco by rail and stored in two 27,000-gallon tanks, placed below the earth, and surrounded by a concrete wall, the oil being pumped to a heater in the fire rooms and from there to the boilers. The company has also installed an Acme gas plant for the ship and engine smithies, having a capacity of 175 fires. While this plant has not as yet been put in operation the company hopes with it to increase the output of its smithies and to improve the class of workmanship. A new building slip has also been added to the ship yard, 550 ft. in length and 80 ft. wide, which will enable the company to take on ships of the largest dimensions.

SHIP BUILDING ALONG THE DELAWARE.



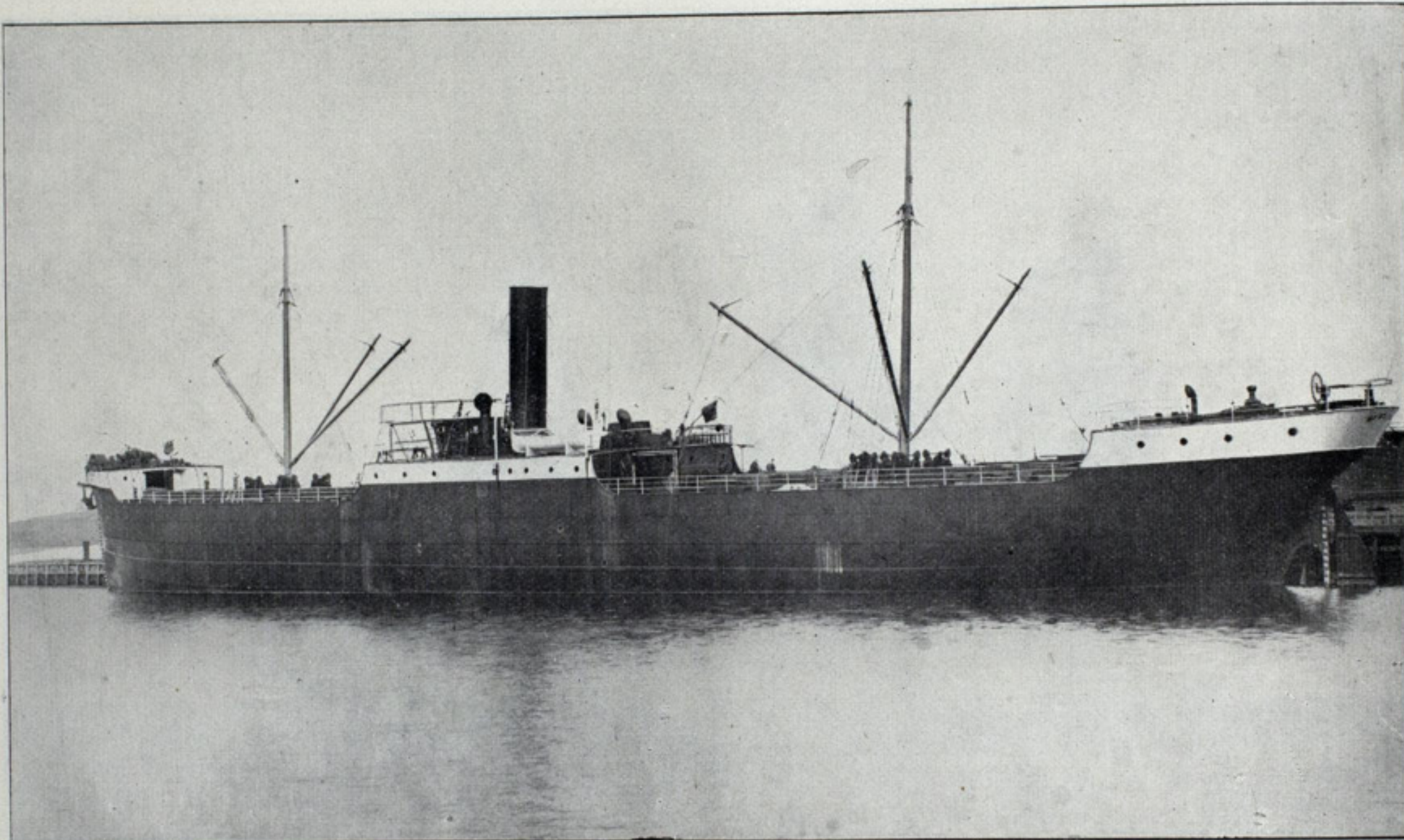
ANNUAL statements for the year 1901 are being prepared by the various ship building industries which have justly earned for the Delaware its title to the Clyde of America. It is understood that in every instance a large balance will be shown on the right side of the ledgers and all reports will indicate an outlook for the future most encouraging. Particularly is this gratifying condition of affairs in evidence in connection with the enterprise known as the William Cramp & Sons Ship & Engine Building Co. It is safe to say that the capacity of this famous plant is double that of three years ago and that the past twelve months established a new record in the amount of work turned out. Although making a specialty of warship construction, the Cramps have not been idle on other varieties of ships as is illustrated by the output of the yard which has been as follows:

The completion of the Imperial Russian battleship *Retvizan*, 12,800 tons displacement, 18,000 I.H.P. and 18 knots speed. On both the builders' and the official trial runs this formidable craft demonstrated its speed and structural strength in a manner eminently satisfactory to the builders and to the Russian government. The *Retvizan*, under command of Capt.

They are each of 12,500 tons gross register and 10,000 I.H.P. The construction of a tank steamship to carry 5,000 tons deadweight, or, in other words 1,500,000 gallons of oil is also under way.

During the past year the Cramp company also built a steel pontoon for a new floating derrick under construction by the government for use at the New York navy yard, and a caisson, to be used for the new navy dry dock at Boston. The company has continued the manufacture of the important hydraulic plant for the various water power systems at Niagara Falls, also the construction of a powerful hoisting plant for the Calumet & Hecla Mining Co., besides a great volume and variety of smaller engineering work not necessary to particularize in a ship building article.

Regarding improvements in plans and methods, it may be said that the Cramp company during the year 1901 completed the installation of its own pneumatic power system, by means of which nearly all riveting, caulking, chipping, boring and portable drilling is now carried on, the amount of hand work employed in these directions being reduced to a minimum. Three overhead traveling cranes, or gantries, have also been installed, each of which serves two building slips.



Steamer J. M. Guffey, first-born of the New York Ship Building Co., Camden, N. J. This vessel was originally christened the M. S. Dollar.

E. N. Stchensnovitch is now in commission and is awaiting sailing orders for home. Her total cost was close on to \$4,000,000.

The Imperial Russian protected cruiser *Variag*, of 6,500 tons displacement, 18,000 I.H.P. and 23¼ knots speed. This vessel sailed for home last spring. Since then the Cramp company has been in receipt of advices indicating that not 5 cents was spent for repairs to boilers or engines after the run across the Atlantic.

The twin-screw steamship *Esperanza* and *Monterey* of 5,000 tons gross register for the New York & Cuba Mail Steamship Co.

The single screw steamships *Apache* and *Arapahoe* of 3,350 tons gross register for the Clyde line.

Work has also progressed as rapidly as the delay in delivering the armor would permit upon the United States battleship *Maine* of 12,500 tons displacement, estimated horse power of about 17,000, and guaranteed to make 18 knots speed in a four hours' trial. This vessel may be said to be about 80 per cent. completed, a material gain being indicated since her launch. During the past few months the advance has been so rapid that naval officials are satisfied that the new battleship can be placed in commission on Feb. 15, 1903, the fifth anniversary of the sinking of the former battleship *Maine* in Havana harbor.

A gratifying progress is also being made on the powerful armored cruisers *Pennsylvania* and *Colorado*, 13,800 tons displacement, 23,000 I.H.P. (estimated), and guaranteed to develop 22 knots speed in a four hours' trial. Both vessels are now framed up to the protective deck and armor shelf and the rapidity which has characterized the delivery of material for their construction warrants the assumption that no vexatious delays arising from this source will fall to the portion of the builders. The *Colorado* and *Pennsylvania* are being constructed on adjoining stocks, with the former craft somewhat in the lead towards completion.

The construction of a protected cruiser of 3,300 tons displacement, 12,000 I.H.P. and 22 knots speed for the Ottoman government has been commenced. It is understood that the vessel will approximate in size to the *Charleston* of the American navy. An inspection board, detailed by the Turkish minister of marine, is expected in Philadelphia shortly to supervise the construction of this cruiser.

The large passenger steamships *Kroonland* and *Finland*, building for the International Navigation Co., are now nearly ready to launch.

A new machine shop, one of the largest and best appointed in the world, has been completed and put in operation. Its site is to the south of the old plant on the land recently acquired from the Lehigh Valley Railroad Co. and it is supplied throughout with new tools, all of which are operated by electric motor power. The Cramp company employs nearly 8,000 men in all departments and is paying higher wages for skilled labor than have prevailed here for many years. The work now on hand, regardless of prospective contracts, assures a continuance of prosperity throughout the ensuing twelve months.

THE NEAFIE & LEVY SHIP & ENGINE BUILDING CO.

A short half mile below Cramp's ship yard the busy Kensington plant of the Neafie & Levy Ship & Engine Building Co. deserves prominent notice for the vast strides made by it during the year just past. According to President Matthias N. Seddinger, at least \$100,000 was expended in that period in the line of general betterments. The latter included a general rehabilitation of the slips and water frontage and resulted in the addition of many more feet to this important accessory. Scarcely three years ago the Neafie & Levy company had but 250 men on its pay roll and was known only as the builder of tugs and barges. The working force is now over 1,400 men and contracts are accepted for craft as large as the protected cruiser *St. Louis*. The following vessels were completed in 1901 by the Neafie & Levy company:

Tug *Penllyn*, 140 gross tons, 350 H.P., Reading company; steamship *Zulia*, 1,740 tons, 1,250 H.P., Red D line; pilot boat *Texas*, 292 tons, 450 H.P., Galveston pilots; tug *Vigilant*, 290 tons, 800 H.P., South Atlantic Towing Co., Brunswick, Ga.; steamship *City of Trenton*, 450 tons, 800 H.P., and steamship *Quaker City*, same dimensions; steamship *Calvert*, 800 tons, 600 H.P., Weems Steamboat Co., Baltimore, Md.; tug *Carlisle*, 640 tons, 1,100 H.P., Reading Company.

The machinery for the following wooden craft has also been completed: Tug *Helen*, Philadelphia parties; steamship *New Shoreham*, 350 tons, 1,100 H.P., Providence & Block Island Steamship Co.; tug *Anna W.*, 200 tons, 800 H.P., National Dredging Co.; tug *Majestic*, 100 tons, 350 H.P., Weaver, Baltimore; freight propeller *Marion*, 250 tons, 200 H.P., Woodall Bros., Georgetown, Md.

Government contracts under way include the torpedo boat destroyers

Bainbridge, Chauncey and Barry, of which the two former are now undergoing trials at sea and the Barry will be launched about Feb. 1; the cruiser Denver, now 70 per cent. completed and to be launched in March, and the protected cruiser St. Louis on which the preliminary work is well advanced in the shops.

THE NEW YORK SHIP BUILDING CO.

The New York Ship Building Co. at Kaighn's Point, Camden, N. J., though but a new enterprise, has achieved wonders with its immense new plant in the short space of its existence. Last year this company completed the steamship M. S. Dollar, its pioneer vessel. Built originally for the Pacific trade, this steamship measures 300 ft. between perpendiculars and 309 ft. 7 in. over all. Her beam, molded, is 40 ft. and her molded depth 26 ft. The displacement of the ship is 5,400 tons and the gross tonnage 2,700. She is fitted with a single screw and triple-expansion engines, the cylinders being 22, 36 and 59 in. diameter, with a stroke of 42 in. Her indicated horse power is 1,500 and her speed 10 knots. The M. S. Dollar has recently been purchased in the interest of the Texas Oil Co. and rechristened J. M. Guffey. She has been converted into a tanker and is running regularly between Sabine Pass and Philadelphia.

In all the New York Ship Building Co. has 124,915 tons under contract. One 8,200-ton ship, the Nebraskan, built for the American-Hawaiian Steamship Co., will be launched next week. Her principal dimensions are: Length, 371 ft.; beam, 46 ft.; depth of hold, 34 ft. Her engines are of 3,000 H.P. and her registered tonnage is 4,500, with a carrying capacity of 5,300 tons. The sister ships to the Nebraskan, the Nevadan and Texan, will be launched in March and April respectively. In addition to these the company is preparing to lay down the keel of a 16,945-ton ship for the Atlantic Transport Co. This vessel will occupy both launching slips where the Nebraskan and Nevadan now are. Four ships in all are included in the Atlantic Transport contract, two over 600 ft. and the others over 500 ft. long. This company has several important contracts pending and will be busily engaged for a long time to come.

Johnson Iron Works, Ltd., New Orleans, La.

The ship yard of the Johnson Iron Works, Ltd., New Orleans, La., was started on an order from the Mexican government in 1899 for twenty sectional steel lighters and five sectional stern-wheel steamers with condensing engines and Roberts boilers. This was followed with an order for a dispatch boat for the Mexican government, to be equipped with a triple-expansion engine of the Johnson make and a Horace See water-tube boiler. This boat is now in service near Belize, B. H. The company has recently furnished a steel hull of 52 ft. length for a dispatch boat, now employed by the bar pilots at South Pass. The plant has a river frontage of 400 ft. and employs 200 hands. The company recently launched the tug El Vivo of the following dimensions: Length, 112 ft.; beam, 24 ft.; depth of hold, 11½ ft. The tug will have two non-condensing engines for driving twin screws 7½ ft. in diameter. The cylinders will be 22 in. in diameter with 26 in. stroke. Steam will be supplied with boilers of the Scotch type, 10 ft. wide and 11 ft. long. The sister tug, El Liste, is about to be launched. Both tugs will be provided with steam steering gear and steam windlass. They are to be employed by the Southern Pacific Railway Co. in New Orleans harbor. The accompanying photograph shows the launch of the El Vivo.

Vessels for Oil Trade.

Mr. J. C. McDowell, general manager of the J. M. Guffey Petroleum Co., has been spending several days in the east where he has been endeavoring to add to the vessel capacity of his company. Three big tank steamers were bought by Mr. McDowell for the new service. Two others have been contracted for. It is understood that the Guffey company has also entered into an arrangement with the Shell Trading & Transport Co. to handle some of its export business. Mr. McDowell, speaking of the plans of the company, said:

"We are putting up tanks now at Tampa, Savannah, in the harbor of Philadelphia, and in that of New York and also at New Haven and Boston. We will shortly have all the transportation facilities necessary. We have already spent \$1,500,000 in this direction and will spend enough more to make those facilities ample. We are taking out of our Beaumont wells now about 15,000 barrels of oil daily, selling about 5,000 of this and tanking about 10,000. We have one new steel barge completed that will carry 30,000 barrels, called the J. M. Guffey. We have purchased two other large iron barges, the Lone Star and the Atlas, each of 3,000 tons capacity, also the tug Taurus, which was owned, as was likewise the Lone Star, by the Boston Tow Boat Co. We have under construction now by the New York Ship Building Co. an additional iron vessel of 30,000 barrels capacity and another one at Bath, Me., of the same capacity. The one at Bath is being built by Arthur Sewall & Co. All the barges and vessels I have mentioned will be put into our coastwise fleet. As to our facilities for shipping oil across the Atlantic, Armstrong Whitworth & Co. of Bristol, England, are building four vessels for the oil trade of our company between Port Arthur and Europe. These vessels are not being built for our company outright but they are being constructed for the Shell Transport & Trading Co., with which our company has an agreement with regard to the shipping of fuel oil. The vessels of this company are already carrying our oil to Europe. The Cardium has taken a cargo of 60,000 barrels to London and will return to Port Arthur on the first of next month for a second cargo. The Strombus, another of the large vessels of this company, is due here on Jan. 15, when a third cargo of oil will be sent to Europe. The Clam, another of the vessels of this company, is in Philadelphia now and if we can arrange for her she will come to Port Arthur and take over a cargo of oil right away. Our refinery at Port Arthur is running night and day and turns out 5,000 barrels of oil per twenty-four hours. We have let contracts to increase its capacity to 15,000 barrels just as soon as the construction work can be done."

Turkish Cruiser Building at Cramps.

Philadelphia, Jan. 8.—The keel of another foreign warship will soon be laid by the William Cramp & Sons Ship & Engine Building Co. and when completed she will fly the crescent of the Ottoman empire. The first payment has been made by the Turkish government to Gen. R. J. Williams, Cramp's representative abroad, and the firm has advised the Turkish minister of marine that it is prepared to begin work on the vessel. An inspection board has been appointed and is expected to arrive at the ship yard by Feb. 1. The plans and specifications were prepared some time ago when an admiral of the Turkish navy was here and made arrangements so that work could be started as soon as a portion of the money was in the hands of the firm. So firmly was the Sultan's representative impressed with the belief that the standards of the United States navy could not be improved upon that the specifications for the new ship make them the official standard for the Turkish navy. As modern cruisers go the new vessel is small, hardly being of the second class according to the measurements of the American navy and yet larger than the average third-class cruiser. It will, however, be the finest vessel of the Turkish navy, which is at present without serviceable fighting ships.

The new cruiser will have a length of 240 ft. on load water line, with a beam of 42 ft. and with 16 ft. draught. This will give her a displacement of 3,250 tons. The speed requirement is most severe and will make her the equal of the now famous Variag, except in size and armament. Under the contract she must develop a speed of 22 knots and this is to be secured by means of twin screws and two triple-expansion engines of 12,000 I.H.P. The steam is to be generated in Niclausse water-tube boilers of the same pattern as those in the Russian ships Retvizan and Variag.

In armament the vessel will have unusually heavy batteries for a cruiser of her class and size. The main battery consists of two 6-in. quick-fire guns, to be placed one forward and one aft on the middle line of the ship and protected by armored shields; eight 4.7-10-in. quick-fire guns, arranged in 'midship battery and similarly protected. The secondary battery consists of six 47-millimeter rapid-fire guns and six 1-pounder machine guns, all protected by shields. In addition, there are to be 175 magazine rifles for the crew.

The entire ship will be lighted by electricity, and there will be four searchlights, two forward and two aft, located on the superstructure and on the military tops. All of the ammunition hoists are to be operated by electricity and each by a separate motor. The cruiser is to have two steel masts with military tops, with wooden spars for signaling. In internal fittings the details of construction used in the United States navy will be closely followed. This applies to ventilation, sanitation and includes space for quarters for officers and crew. The new cruiser will be



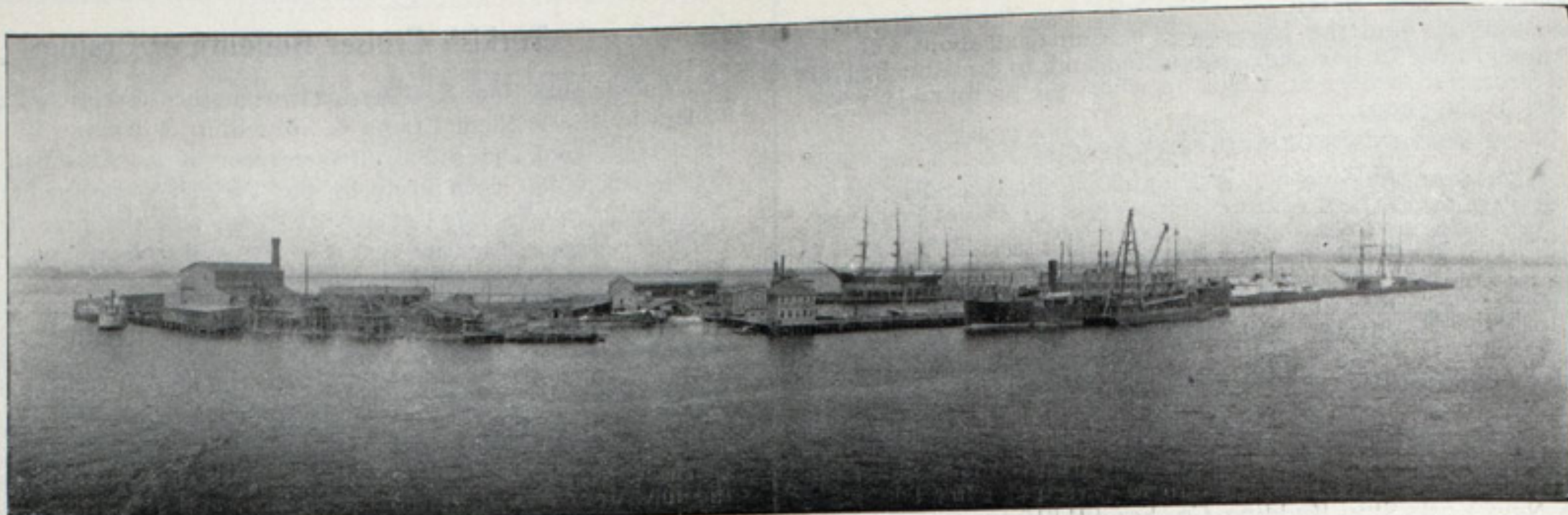
Launch of the tug El Vivo at Johnson Iron Works, New Orleans, La.

fitted as a flagship and will accommodate twenty officers and 280 men. There is no time clause in the contract but the vessel is to be turned over to the Ottoman government complete and ready for use.

Electric Hoisting Plant for Discharging Vessels.

Among the number of pamphlets issued by the C. W. Hunt Co. of New York is one relating to an electric hoisting plant for discharging vessels. The plant described handles 25,000 tons of coal annually, is situated in New York harbor and is equipped with "Hunt" electric hoist and automatic railway. The coal is hoisted by means of the electric hoist from canal boats in 1-3 ton tubs, on a mast and gaff, to the automatic railway car by which it is distributed in the yard. The car runs on an elevated self-acting railway and requires no steam, horse or manual power for its operating. With the previous equipment the coal was hoisted by horse power and trimmed into the stock pile. The old equipment cost \$1,750, the new one \$2,800. The cost of handling to the stock pile, interest and depreciation included, was, with the old plant, 17¼ cents per ton; with the new plant the cost is 7¼ cents. This difference of 10½ cents per ton on 25,000 tons per year makes an actual saving of \$2,625. Thus every thirteen months the whole cost of the plant is saved in the reduction of the pay roll.

J. R. Ellerman, London, has contracted with Workman, Clark & Co., Belfast, for the construction of a steamship of over 7,000 tons gross register and over 10,000 tons carrying capacity.



Panoramic view of Shooter's Island, New York, where works of Townsend & Downey Company are located.

WORKS OF THE TOWNSEND & DOWNEY CO.

The Townsend & Downey Ship Building & Repair Co. commenced operations on Shooter's Island, New York, on Jan. 1, 1900, and has steadily advanced, until it has gained for itself a valuable reputation and a place among the ship builders of the country. The plant covers an area of fifteen acres and has over a mile of water front. The machine, boiler, plate, blacksmith and joiner shops are equipped with the most modern tools and appliances for building and repairing any type of vessel. All of

designs by Messrs. Cary Smith & Barbey. The vessel is to be christened at the request of Emperor William by Miss Alice Roosevelt, the daughter of the president of the United States.

A three-masted steel schooner yacht, 135 ft. over all, for Mr. Gibson Fahnestock, from designs by Mr. Theodore E. Ferris.

An auxiliary schooner yacht, 77 ft. on the water line, for Alesandro Fabbri, from designs by Cary Smith & Barbey.



Vessel being hauled out on 4,000-ton marine railway at the works of Townsend & Downey, Shooter's Island, N. Y. Time 29 minutes from being centered on keel blocks until dry.

the machines are electrically driven and everything about the works is thoroughly up-to-date in every respect. This company built during 1901 the following vessels:

Steam dredge Sabine for the United States government.

Schooner yacht Thistle, 144 ft. over all, for Mr. Robert E. Tod, from designs by Mr. H. C. Winteringham.

Schooner yacht Elmina, 108 ft. long, for Mr. Frederick F. Brewster, from designs by Messrs. Cary Smith & Barbey.

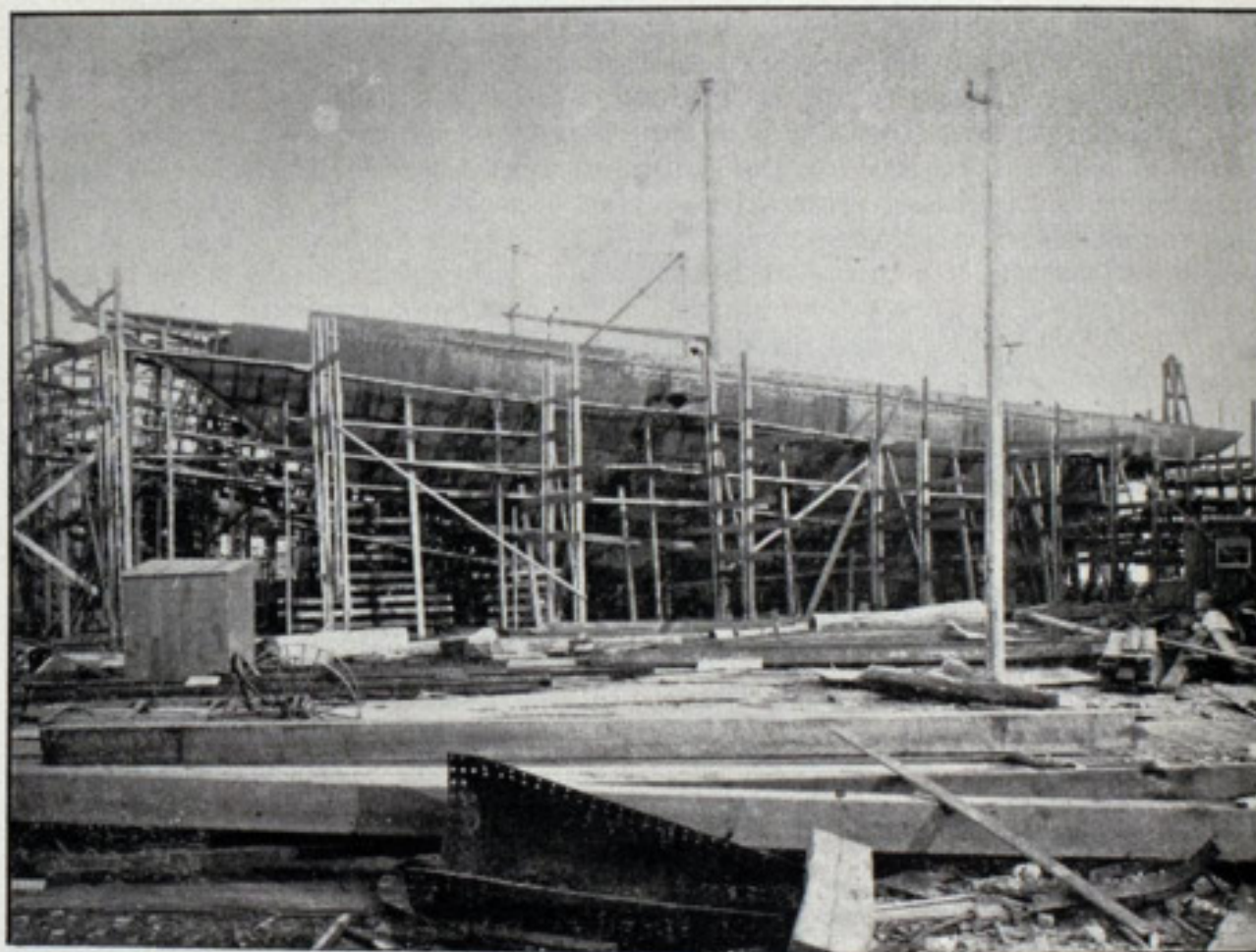
Schooner yacht Muriel for Chas. Smithers, Esq., from designs by Messrs. Cary Smith & Barbey.

Steamer Bache, 163 ft. long, for United States Coast and Geodetic Survey.

Ferry boat North Beach for New York & College Point Ferry Co., from designs by Mr. Henry J. Gielow.

They have now under construction for the season of 1902:

A steel schooner yacht, 160 ft. over all, for the German emperor, from



Three-masted schooner yacht for Mr. Gibson Fahnestock as she appears on the stocks. Building by the Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y.

A bronze cutter yacht, 57 ft. on the water line, for Mr. G. Mallory Pyncheon, from designs by Messrs. Gardiner & Cox.

Two steel tank oil barges, 360 ft. long, 50 ft. beam and 29 ft. draught, for Standard Oil Co.



Schooner yacht for the German Emperor as she looks now on the stocks. Building by the Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y.

The steamship Saale, formerly of North German Lloyd, burned during the Hoboken fire, 1900, was rebuilt and engined in 1901.

The company's marine railway, the largest in the world, has a capacity of 4,000 tons. During the present year the capacity of the plant will be doubled. A large number of new tools have been bought and will be installed within the next three months.

BUSY IN YACHT CONSTRUCTION.



THE Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y., have had a very busy year. They have under way at present several yachts for this season's delivery, among them a steel, steam yacht of the following dimensions: Length over all, 185 ft.; beam, 22 ft.; draught, 9 ft. She will be schooner rigged, will have two deck houses and will be designed for a speed of 17 miles. She will be equipped with a Seabury triple-expansion engine with cylinders of 13½, 21 and 34 in. diameter and 21 in. stroke. This yacht will have Seabury boilers. The name of the owner withheld. Also a steel, schooner yacht, of 118 ft. length over all, 22 ft. beam and 12 ft. 6 in. draught. The name of the owner in this instance is also withheld.

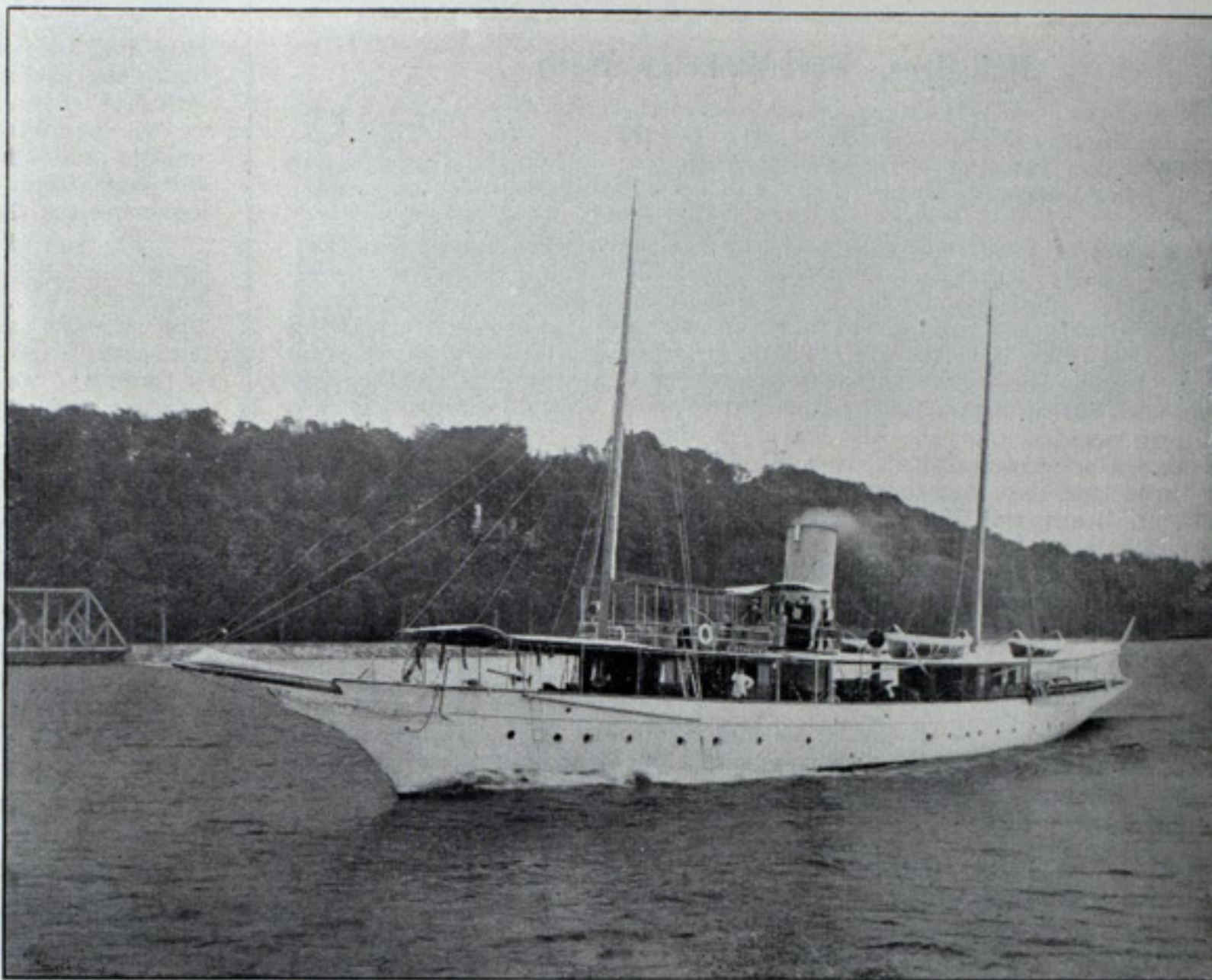
A twin-screw, steel, steam yacht for Mr. John H. Rutherford will be of the following dimensions: Length over all, 117 ft.; beam, 16 ft.; draught, 4 ft. 6 in. She will be schooner rigged and will have a trunk cabin. She is designed for a speed of 16 miles and will have two triple-expansion engines, 7, 11¼ and 17½ in. diameter by 10 in. stroke and Seabury water-tube boiler. A twin-screw steam yacht for John D. Archbold will be of wooden construction and of the following dimensions: Length over all, 100 ft.; beam, 12 ft.; draught, 4 ft. 9 in. She will have two triple-expansion engines with cylinders of 7, 11¼ and 17½ in. diameter and 10 in. stroke, and a Seabury water-tube boiler. This vessel will have a speed of 20 miles. A steam yacht of wood construction and trunk cabin, the name of whose owner is also withheld, will be of the following dimensions: Length, 85 ft.; beam, 12 ft. 6 in.; draught, 4 ft. 6 in. Engines will be triple-expansion with cylinders of 7, 11¼ and 17½ in. diameter by 10 in. stroke. The boiler will be of the Seabury water-tube type.

During the past year the company has finished a number of successful yachts, among them the Hope, the Cherokee and the Irene. The Hope is of modern design, embodying a combination of speedy and handy craft, with fairly good cruising accommodations. In model she has the overhanging stem and round stern, which give a smart and trim appearance. The construction is wood, an oak frame with double planking of cedar, and the trunk house is built of steel. The deck house is of red mahogany. The owner has a very comfortable stateroom in the after section, taking the full beam of the boat, fitted with a double and single berth, and having toilet adjoining. The balance of space aft in the housing is given to a large saloon and for lock-erage. Just aft of the house she has a cockpit, which is one of the delightful features in agreeable weather. Her deck house is used for dining, having a connection with the galley below. It is also adaptable for sleeping quarters and has a toilet adjoining. The crew of five have accommodations forward. She is equipped with a Seabury triple-expansion engine and Seabury water-tube boiler and will have a speed of about 17 miles per hour.

The Cherokee represents about the smallest size of practicable flush-deck yacht, and is built of wood throughout. Her deck house and deck joiner work are of mahogany, the former providing dining accommodations, and used also for social entertainment and as a resort above deck during inclement weather. The owner has two connecting staterooms in the after section below, a toilet room, lavatory and

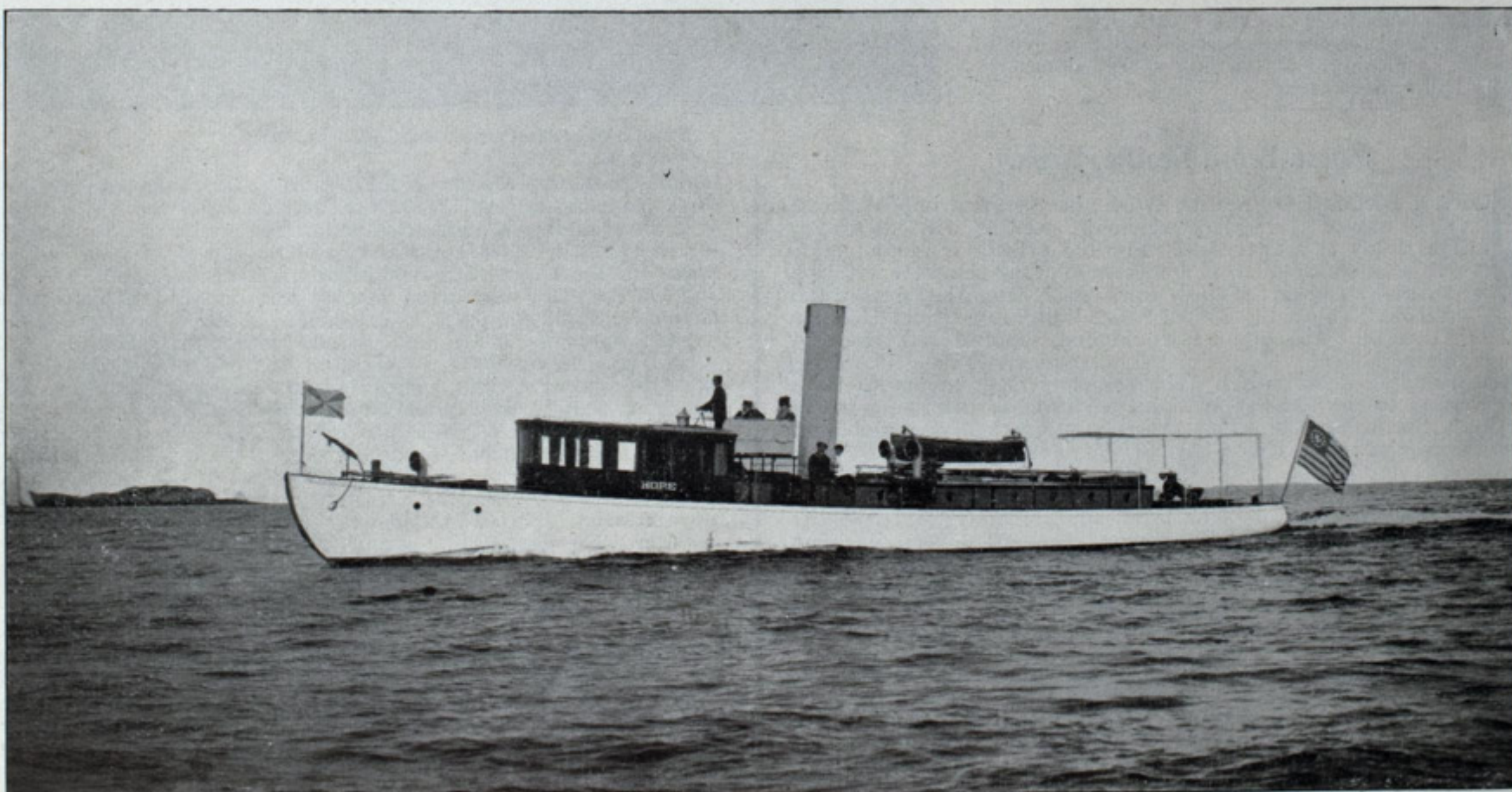
saloon. Finish of the staterooms is white mahogany, and of the saloon and toilet compartments red mahogany. Her steering gear is placed at the after end of the deck house, and the bridge is large enough to accommodate three or four people with seats. In craft of this size it is quite frequent that the owner handles the wheel to a considerable extent. The crew, consisting of five men, have quarters forward. The galley is also located forward, and beneath the deck house for convenient serving of the table. This yacht is equipped with Seabury triple-expansion engine and water-tube boiler and has an electric light plant. She is steam heated. She carries a cutter and dinghy on the davits. Her coal capacity is six tons, and she has sufficient tank storage for 750 gallons of water. For a yacht of this class, she is one of the most comfortable and complete that can be designed.

The steam yacht Irene, built for Mr. Leonard Lewisohn of New York is of the following dimensions: Length, 155 ft.; beam, 18 ft.; draught,



LEONARD LEWISOHN'S TWIN-SCREW, STEEL STEAM YACHT IRENE.
Built by the Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y.

7 ft. 6 in. The hull is of steel construction and embodies all the elements essential to a comfortable and modern pleasure craft. She has two deck houses, finished in paneled mahogany inside and outside. The forward house is used for dining, and has a buffet and butler's pantry at the after end, to which the dinner is supplied by dumb waiter connection to the



MR. GUY NORMAN'S STEAM YACHT HOPE.

Built by Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y.

galley below. The after deck house is designed for social entertainment, and has a piano of special manufacture to harmonize with the yacht finish. Below deck aft the owner's quarters are located and consist of a large saloon and four staterooms. The owner has two staterooms connecting with each other and occupying the full width of vessel, and adjoining them a bath room, which also extends to the full beam, fitted with tub and shower bath, lavatory and other toilet conveniences. She has exceptionally large port and starboard staterooms for guests, with toilet and bath adjoining each. The saloon is finished in white enamel and gold, and the other compartments in white mahogany. She is propelled by twin screws, driven by two Seabury triple-expansion engines, and has a Seabury water-tube boiler. The yacht is equipped with auxiliary blower, circulating and electric light engines, electric lighting equipment, storage battery and searchlight, steam steering gear and windlass, and steam heaters. Her coal bunker capacity is 22 tons and she carries tankage for 4,500 gallons of fresh water. The forecabin has berthing facilities for a crew of fourteen men, separate staterooms for captain and engineer, mess room, two toilet rooms and boatswain's locker. Furnishings and fittings are elaborate, both above and below decks. Two naphtha launches and two small tenders are carried in her davits. Her speed is 18 miles an hour.

Hall Bros., Port Blakeley, Wash.

Hall Bros., Port Blakeley, Wash., seem to have, as one of the photographs on this page would show, a ship yard in a forest. They have built up a very thriving business since they removed to the Puget sound district from Cohasset, Mass. Their work is naturally entirely in wooden vessels.

"We have a small mill equipped with a Hyde jig saw," said Mr. Hall. "Daniels planer, trimmer, table saw, hand saw, treenail machine, wood-turning lathe and bolt cutter. There is a steam donkey engine for handling heavy work in hauling and hoisting and a steam winch for masting and rigging. We have during the past year put in an electric light plant and an Ingersoll-Sergeant air compressor and new boilers. Other improvements of an important nature are under consideration, but not definitely decided on yet. We have on the stocks a five-masted schooner, 240 ft. over all, 42 ft. beam and 18 ft. hold, and two four-masted schooners, 200 ft. over all, 39 ft. beam and 15.5 ft. depth of hold. The capacity of our yard is three vessels at one time."

The yard covers about ten acres of land and has been established at Port Blakeley since 1881.

System of Safety Doors.

Two representatives of the press and a number of invited guests of the North German Lloyd Steamship Co. last week gave an exhibition of the Dorr system of safety water-tight bulkhead doors with which the new express steamer Kronprinz Wilhelm has been equipped. The doors can either be closed or opened from the bridge, or from some other central part of the vessel, from the engine room or at the door itself. The system worked successfully and it was announced that the entire fleet of the North German Lloyd would be equipped with this safety arrangement, which, it is claimed, will make the vessels non-sinkable, or practically so, in case of collision. The watch officer on the bridge under the Dorr system is at any time able to close all open compartment doors in case of an approaching collision, and can open the doors as easily. In order to close the compartment doors under this system it is necessary to move a lever, in doing which electric bells are sounded at every door, ringing for about twenty seconds. Thereupon the doors close slowly, this method having been decided upon to avoid accidents. The closing and opening of the doors is effected by hydraulic pressure.

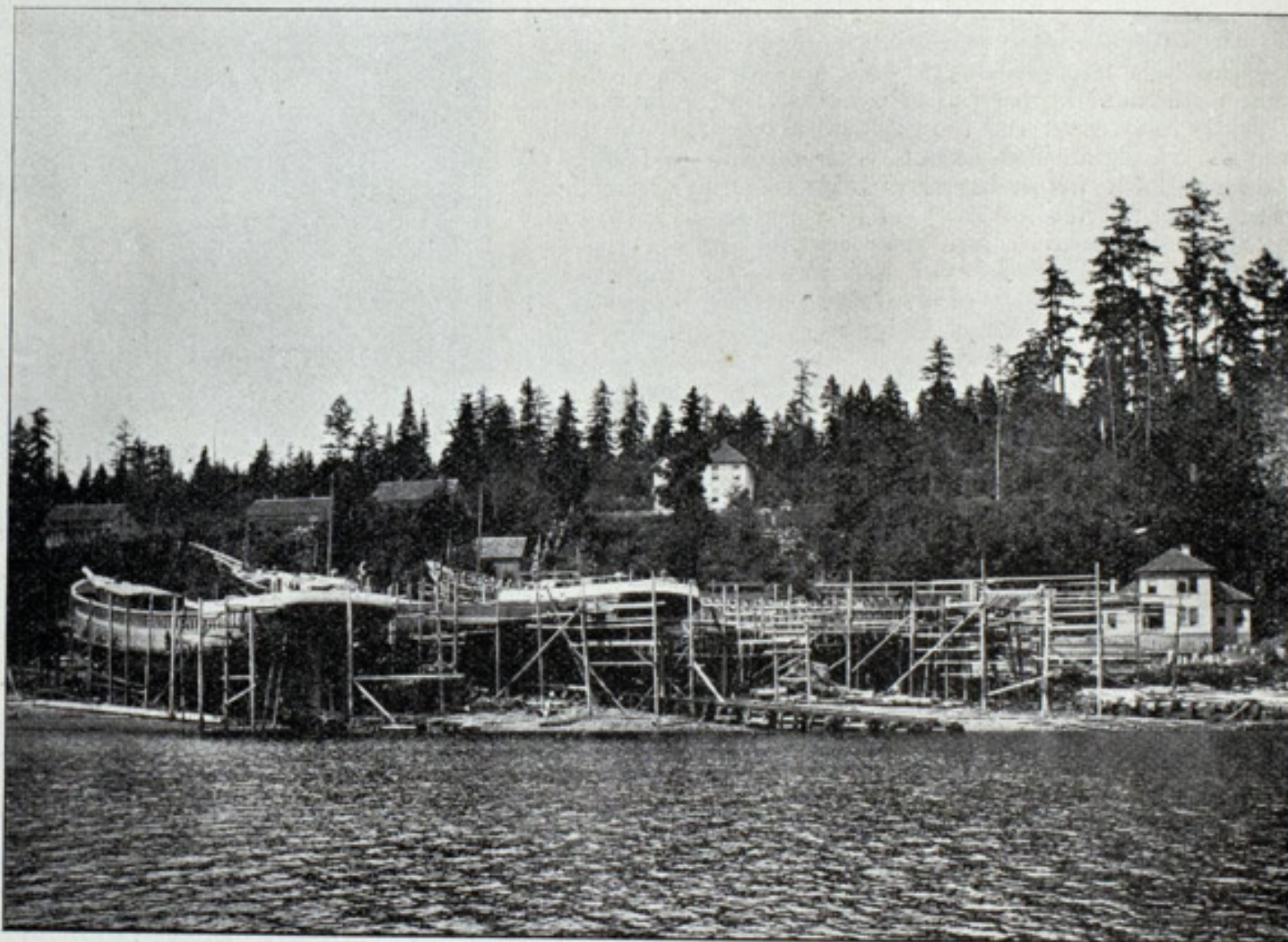
Moran Bros., Seattle, Wash.

MORAN BROS. CO., Seattle, Wash., have several improvements under way at their plant which the Review will enter upon thoroughly at a later date. For the present it is content to give a summary of work under way. One complete vessel is now under contract at these works aside from the naval orders on hand. This is the United States lighthouse tender Heather, 178½ ft. long over all. The engine is compound, supplied with steam by two Scotch marine boilers. The estimated horse power is 750. The vessel is of steel, including deck houses. The company is preparing to make extensive repairs to the steamer Williamette, formerly belonging to the Pacific Coast Steamship Co. This vessel was wrecked on submerged rocks off Denman island in Union bay, British Columbia, March 16, 1901, while running from Comox, B. C., with 900 tons of coal cargo to Ladysmith, B. C., to finish loading. Soon after striking on the rocks the hull broke in two amidships, and it being to all appearances impracticable to save the vessel the wreck was sold to the underwriters on April 16, 1901. Mr. Robert Moran, president of the company, conceived the idea of joining the two parts and floating the vessel and he purchased the wreck at the underwriters' sale. A wrecking outfit was taken to the scene of the wreck from the company's works at Seattle and repairs were first made, consisting of bringing the two parts of the hull together by means of heavy screw bolts working in sockets attached to the outside of the hull and then joining the two halves permanently by means of plates and bars riveted on. This splice could, of course, not be extended to the keel without a great deal of trouble and expense in building a cofferdam enclosing the break and extending under the vessel. The splice, although amply strong at the deck line, was not found to be sufficiently so near the bottom, for when it was attempted to float the vessel as a whole the splice parted from the bottom upwards, leaving the wreck seemingly hopeless in two parts as before the operations had begun.

The idea then occurred to Mr. Moran of using timber for splicing the two parts instead of steel plates, and without any precedent for his guidance in such operations he proceeded to build a heavy timber splice on each side, securing the timbers as strongly as practicable to the steel hull structure and the timbers to each other in such a manner as to make a very solid wall of timber on each side extending about 40 to 50 ft. fore-and-aft. This work, considering the adverse circumstances under which it was done, the position of the wreck, and the fact that Mr. Moran was hampered by reason of labor troubles, his crew being reduced to a small number of men inexperienced in that line of work, proved to be of considerable magnitude, but with much patient labor and untiring energy on the part of the leader the task was finally completed and the splice was found to be efficient, not only enabling the two halves of the vessel to hold together afloat, but holding them as rigidly as if the original plating of the vessel had existed.

The machinery being but little injured on account of the wreck, owing to the forethought of keeping the same well saturated with oil, was found to be in sufficiently good condition after pumping out the engine room to enable the vessel to run under her own steam. The main boilers, however, could not be used on account of the break in the hull being in the fire room, and the splice not extending under the ship's bottom, the water thus had free access to the fire room, partly covering the main boilers. With the use of the donkey boiler, however, which was located above the water level in the fire room, aided by boilers erected on the deck as part of the wrecking outfit, sufficient steam was provided to run the main engine at a reduced speed, and the vessel left the scene of the wreck under her own steam and proceeded to Seattle, a distance of about 250 miles, covering the distance with an average speed of 6 knots per hour.

The vessel is now at the Seattle works awaiting the completion of a special cradle and marine railway on which she is to be hauled out for repairs. The hull is to be thoroughly overhauled, parts being renewed and strengthened where necessary; it being the intention to restore the vessel to a condition equal to the originally new vessel. Her machinery is modern, consisting of triple-expansion propelling engine and Scotch marine boilers, operated under Howden hot draft. The company is also



Ship yard of Hall Bros., Port Blakeley, Wash.

making extensive repairs to the steamship Roanoke, the steamship Oregon, steamship Eureka, steamship Tampico and a number of other vessels. It is also building a number of boilers for marine use, including a boiler for the United States coast and geodetic survey steamer Gedney and a boiler for the United States lighthouse tender Columbine.

The company has during the past year extended its plant considerably, having built and equipped a new machine shop 100 by 350 ft., a new blacksmith shop 100 by 100 ft., and extended its foundry plant and boiler shop. A ship shed 90 by 850 ft. is in course of construction, this shed crossing the main shops at right angles and having two electric traveling cranes which are thus enabled to handle materials direct from the shops to vessels under construction. A ship fitting shop 100 by 210 ft. is also in course of erection. Plate and bar furnaces are being built. The company has just installed the best up-to-date tools and appliances for its line of work. It has also added to its plant a floating dry dock of 80 by 200 ft. and 2,500 tons capacity. This is but the first section of a 400-ft. dock of 5,000 tons capacity. This first section is now fully equipped and is in operation.

Fairbanks, Morse & Co.'s Engines.

Fairbanks, Morse & Co. of Chicago, who last year built a larger number of gasoline engines than any other concern in this country, are issuing a very handsome catalogue devoted exclusively to their line of marine engine, to which they have added several sizes the past season. They build both the two and four-cycle types, the latter ranging in size from 20 to 100 H.P. and constructed with two, three and four cylinders, depending upon the size. These larger sizes are especially adapted to freighters and fishing boats. Those interested should write Fairbanks, Morse & Co. for a copy of their catalogue which will be mailed upon request.

William A. Boole & Son of San Francisco.

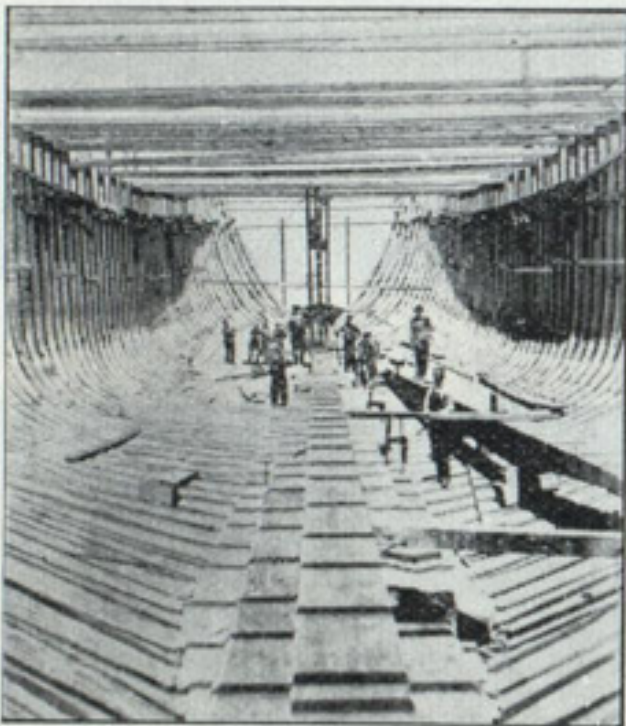


Lahama, the first born.

a 12-in. ship frame. We have one of the most modern four-sided surfacers on this coast, it being capable of surfacing four sides of a stick of timber 30 by 30 in. with the one planing. We have our own electric light plant, which serves in good stead, not only to light the plant when working at night, but when working in the hold of a vessel where it is impossible to see without some artificial light.

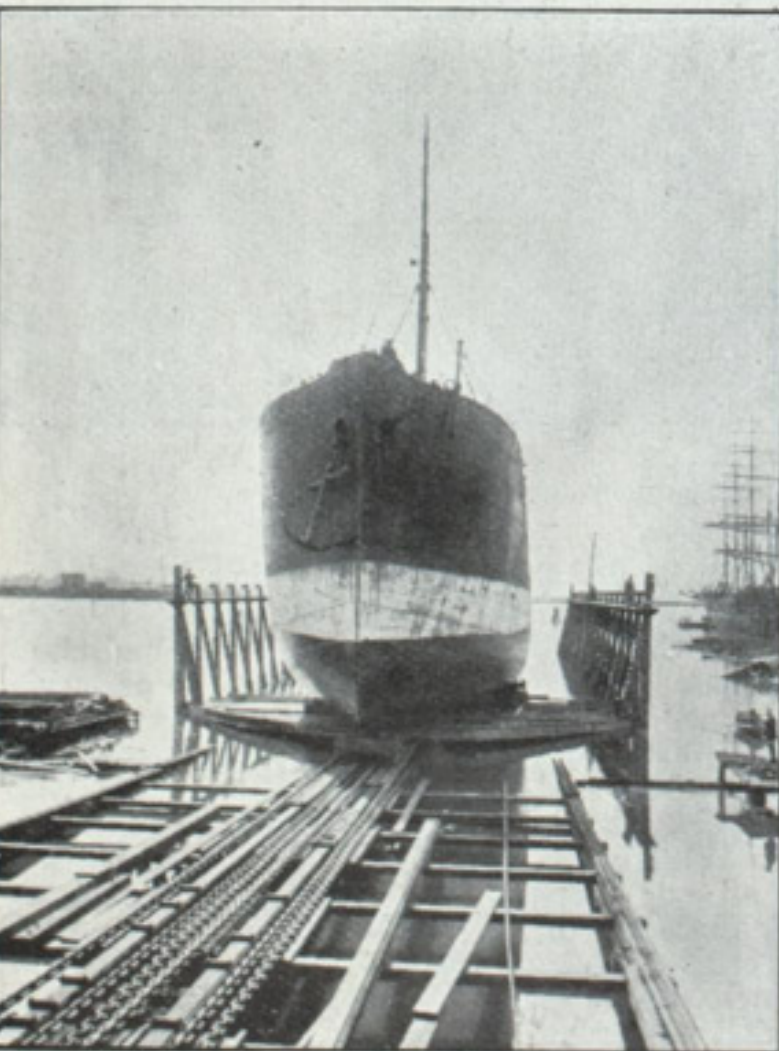
"We take great pleasure in making mention of our marine railway, constructed by H. I. Crandall & Son, of East Boston, it being one of their most modern of marine railways, and probably the last one which they have constructed. The great advantage we find in this mode of docking is the extremely short time which it takes to dock ships. The Norwegian steamer Tellus, of 2,522 tons, shown in one of the photographs, was docked in twenty minutes."

The New England Co., Bath, Me.



Barkentine Koks Head, largest wooden vessel ever built on the Pacific Coast, to be launched Jan. 11 By William Boole & Son.

little generally in the way of ornamentation. The first ship built by us was the John H. Kimball. She was commanded by Capt. Dennis H.



Norwegian steamer Tellus, docked on marine railway of William A. Boole & Son, San Francisco, in twenty minutes.

For some reason they didn't prove a brilliant success. They were built during a period of transition in shipping. Steam vessels had forged rapidly to

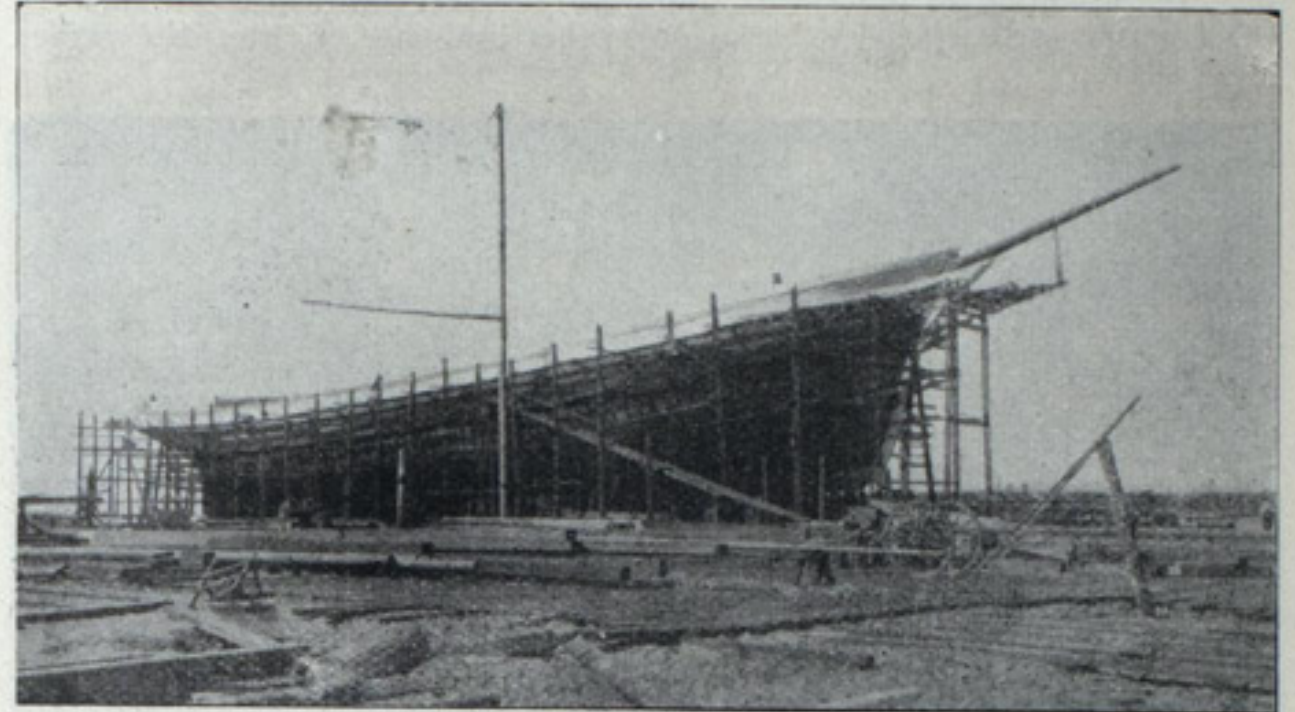
The New England Co., Bath, Me., has had a long and honorable career in the building of wooden vessels. It has a list altogether of 281 vessels to its credit. Of this number there have been twenty-six ships, thirty-five barks, seven brigs, four barkentines, 143 schooners, four steam schooners, twenty-seven steamers, two steam yachts, seven steam barks and other craft, including tugs, ferry-boats, pilot boats and steam whalers. In speaking of its career a member of the company says:

"Yes, we have built most everything in the way of wooden vessels. Years ago the ship was a more picturesque article than it is today, with all its modern appliances for the saving of manual labor. The high sides, single topsails and life-size figure heads have given place to low free-boards, double topsails and very

"The first schooner built in our yard was the John Crocker. She was launched Feb. 27, 1866, and registered 208 tons. She was quite a schooner in those days, but wouldn't be reckoned much now. Among the unique things in the schooner line we have built were two craft known as steam schooners. They had hollow steel masts that were utilized as smoke stacks.

the front and the sailing vessel seemed doomed. I presume it was the purpose of their designers to unite the advantages of both styles. Perhaps that was the secret of their failure, for they possessed the good qualities of neither the steam freighter nor the schooner. By the way, we built the first four-masted schooner ever constructed anywhere. Much of the same talk we hear now about the impracticability of the six-masters was heard then about that vessel. There was a limit to the size of wooden vessels, she wouldn't hold together, etc. I notice that the big six-masters have no difficulty in holding together.

"Perhaps the most successful vessel ever turned out at this yard from a money making standpoint was the steam whaler Marion and Helen, built for William Lewis of New Bedford. In less than two years in the whaling business she paid for herself, and was then sold to the government for a figure that gave a pretty liberal profit on her original cost.



Four-masted Barkentine, Koks Head, building by William A. Boole & Son, San Francisco. This vessel, unlike other sailing vessels, has bilge keels.

She carried the relief expedition that went out to search for Lieut. De-Long, of the ill-fated Jeanette. Most of the steam whalers we built are still alive and doing well. Many people, you know, imagine that the whale fishing industry is a thing wholly of the past, but I assure you that it is not. There is still quite a fleet that make good money whaling. If I remember rightly the first whaler we built was a small sailing bark of some 200 tons. Fancy drifting round among the icebergs in such a craft. Of all the vessels we have built we have never but once had an order from a foreigner. That was for the bark Kepler, built for a German. I can't remember what the circumstances were that induced him to have his vessel built here."

Annual Meeting of the Lake Carriers.

It is quite probable that at the annual meeting of the Lake Carriers' Association, which opens at the Hotel Cadillac, Detroit, on Wednesday, the 15th, the presidency will be unanimously offered to J. C. Gilchrist of Cleveland and that he will accept the office if tendered him in that way. It has been the custom of the association to select presidents unanimously and there is no indication of departure from the rule this year. This guess as to the next president is based mainly on the fact that leading members of the association will urge the necessity this year of electing a Cleveland man, so that he may be in full touch with the executive committee, and Mr. Gilchrist is the choice of Cleveland members. At this meeting Mr. Chas. H. Keep of Buffalo, secretary of the association since its organization, will resign on account of other business demanding his attention. Mr. Keep has been a very capable secretary. Harvey L. Brown, attorney of Buffalo, and son of Capt. J. J. H. Brown, is a candidate for the place. The secretaryship has always been regarded as a Buffalo office, and as Mr. Brown will have very strong support from Buffalo, it is more than probable that he will be elected.

Vessel Construction During Six Months.

During the six months ended Dec. 31, 1901, there were built in the United States and officially numbered by the bureau of navigation 717 rigged vessels of 154,073 gross tons, compared with 568 rigged vessels of 179,229 gross tons for the corresponding six months of 1900. Canal boats and unrigged barges are not included. The principal decline, 19,752 tons, is on the Atlantic seaboard, and is attributable to work on several large ocean steamers, which will be completed during the coming six months. Included in the six months figures are thirty-eight vessels, each over 1,000 tons, and aggregating 103,832 tons. Of these fourteen steel steamers aggregating 52,310 tons were built on the great lakes. Four are for the seaboard, two banana steamers, Watson and Buckman, each of 1,820 tons, the Hugoma 2,182 tons, and the Minnetonka, 5,270 tons. The Minnetonka will be cut in two to pass the canals. On the seaboard fifteen wooden schooners of 24,864 tons were built, five steel steamers for the coasting trade, and one steel ferry boat, aggregating 20,964 tons. Square rigged vessels are the steel ship William P. Frye 3,374 tons, and two barkentines on the Pacific, aggregating 2,310 tons.

	WOOD.				STEEL.				TOTAL.	
	SAIL.		STEAM.		SAIL.		STEAM.			
	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.
Atlantic and gulf.....	344	39,723	134	10,204	2	3,609	22	30,811	502	84,347
Porto Rico.....	2	34							2	34
Pacific.....	25	14,490	32	3,781					57	18,271
Great lakes.....	5	149	42	1,956			16	43,750	63	45,855
Western rivers.....	6	114	85	5,469			2	43	93	5,626
Total.....	382	54,450	293	21,410	2	3,609	40	74,604	717	154,073

THE WILLIAM R. TRIGG CO., RICHMOND, VA.

WHEN we consider the extensive seaboard with which this country has been blessed by nature, and the practically innumerable waterways leading from the ocean to the interior, both tidal and fluvial, the observer is struck with the fact that up to very recent times but little advantage has been taken of these natural waterways for purposes of adding to the national defence. This term "national defence" refers, of course, in this connection to ship building; and it is, as above remarked, a notable fact that until the establishment of the Trigg ship building works on the banks of the James, at Richmond, Va., little, if any, use had been made of these manifest and manifold advantages. Immediately following the conclusion of the civil war, the attention of investors, moneyed men and political economists of the country was attracted to almost all other branches of enterprise rather

than to that of the building of ships and machinery; but gradually, as our national development took on new phases, and as it became more and more evident that in order to maintain the position in the political world which the fathers foresaw, it came to be understood that ship building must take a prominent position in the country, and the inception of several large firms which now enjoy the confidence of the world was the result. The seacoasts, however, as named above, were almost the only parts of our country favored with the moneyed enterprise of ship builders. Even the great father of waters, the Mississippi river, had never been taxed to bear on his rapid bosom the war vessels which should defend his channels from the keel of the possible invader, and even now there is not a single ship building plant for ocean steamers on the banks of this mighty river. Without entering too deeply into the reasons for this state of affairs, it will suffice to say that history does not record such a development of ability to invent, plan, build and fight such ships as have been laid down and launched for the United States of America within the few years just coming to an end.



Machine shop, William R. Trigg Co., Richmond, Va.



Pattern shop, William R. Trigg Co., Richmond, Va.



Joiner shop, William R. Trigg Co., Richmond, Va.



Carpenter shop, William R. Trigg Co., Richmond, Va.

Foremost among the fresh water builders whose energies have been turned in the direction of naval ship building and engine construction, none have succeeded better than the William R. Trigg Co. of Richmond,

month in the year, and the facilities for the prompt carrying out of contracts bestows advantages on the William R. Trigg Co. enjoyed by no similar corporation. The plan of the works, which were established about 1898, in their entirety contemplates the construction of battleships, cruisers, torpedo boat destroyers, torpedo boats, revenue cutters, and merchantmen of all classes, and has been matured by the gradual process of evolution; and the success attending the early efforts of this young company is the best evidence that these plans have ripened with their growth. At the end of the year 1901, the William R. Trigg Co. had completed and tested three torpedo boats and one torpedo boat destroyer; and at the beginning of the present year there are on the stocks, in various stages of progress, one United States cruiser of 3,200 tons; a Chesapeake & Ohio Railway Co. passenger steamer, nearly ready for use; two United States revenue cutters; one freight and passenger steamer for the Old Dominion Steamship Co.; a large suction dredge for the United States army, to dredge the lower Mississippi river; a sea-going tug for the Pennsylvania railroad; and a 5,000-ton oil tank steamer for the Standard Oil Co., for use in its transatlantic business.

With all this work in hand, the William R. Trigg Co. has not yet reached the limit of its capacity, and it will be one of the prominent bid-

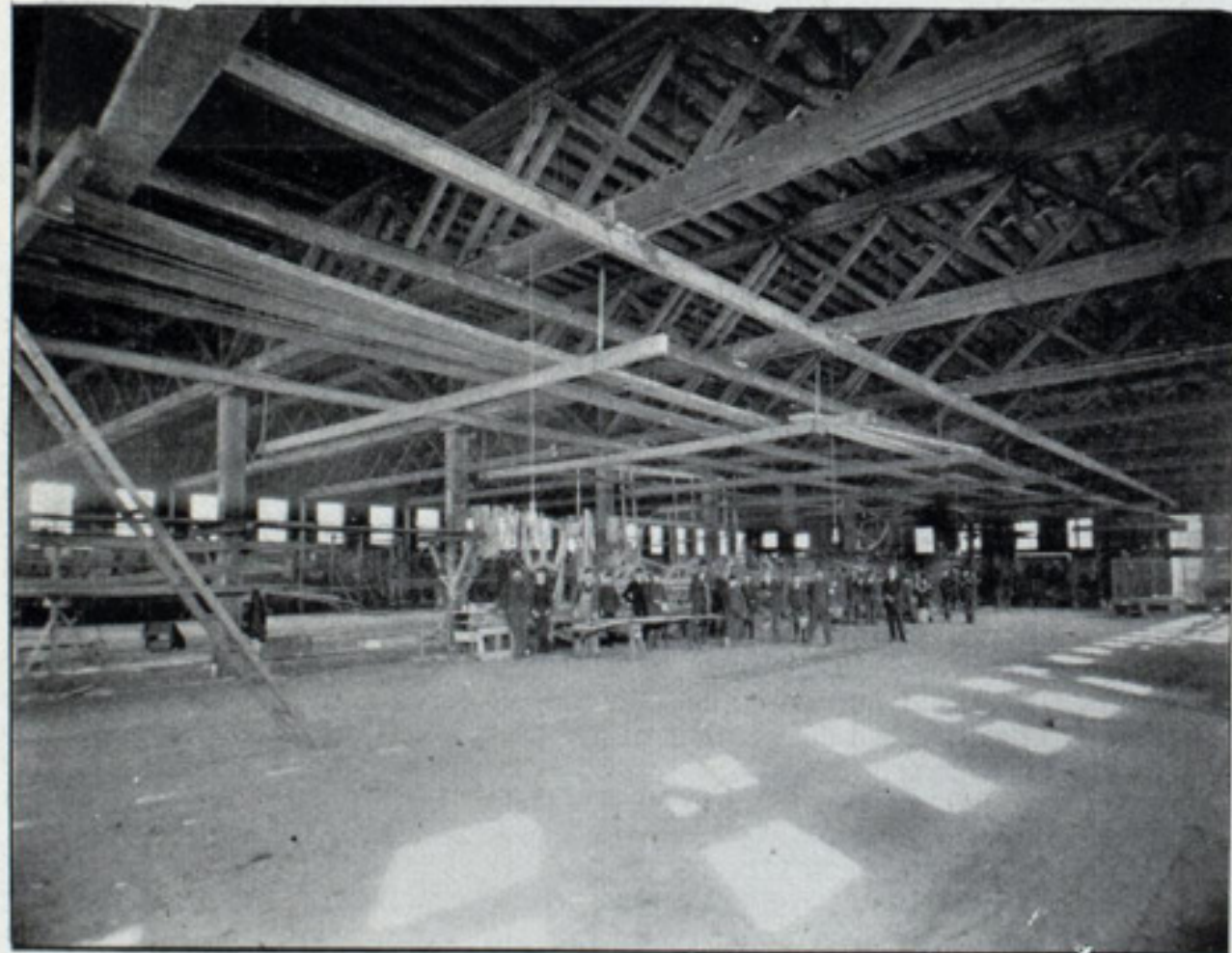
ders for the ships to be appropriated for by the congress now in session. It is not possible, of course, for every city to have a ship yard, and if it were possible, it would not be desirable. But the success which has attended the efforts of the William R. Trigg Co. is, in large measure, an incitement for other cities similarly situated to enter the list of manufactures, either in ships, machinery, or some product in which the defenders of the country can feel a prominent interest.

The total land area included in the works of this company is about twenty-six acres, and the water area is no less than twenty acres; and by "water area" is meant a navigable canal, a launching basin, and a dry dock. And in this connection it is interesting to observe that owing to the difference in level between the canal and the James, both the launching



Foundry, William R. Trigg Co., Richmond, Va.

basin and the dry dock of this company are largely of the "gravity" type; in other words, the launching basin and the dry dock can be emptied into the river without pumping, and filled from the canal in the same economical manner. The tools which have been installed in the shops are from the manufactories of the best makers in the country, and these tools will be actuated entirely by electricity. This electricity, as noted above, is brought to these works with but an insignificant drop in potential, owing to the proximity of the source of power. A great advantage possessed by this company is in its proximity to the coal fields of the famous New River district of West Virginia, for by the facilities possessed by the Chesapeake & Ohio railway the products of this district are brought to



Developing shed, William R. Trigg Co., Richmond, Va.

the doors of the shops. The coke required for use in the foundries is also brought to Richmond over the lines of this powerful company.

The William R. Trigg Co. is not confined in its enterprise to the building of ships and machinery. Its foundry work is of excellent quality. From the earliest days in the history of Virginia, foundries have been in operation more or less extensively at this point, and today the Trigg company controls the best deposits of molding sand and loam to be found in the world. As an evidence of the value of the foundry work turned out it is to be noted that the cylinders and appurtenances for two battleships under contract by the Fore River company have been given to the William R. Trigg Co. for construction. The company has an available depth of 21 ft. of water into Chesapeake bay at high tide.

Now a word, in conclusion, as to the depth of water possessed by the James river. It has been found that at low water there is a channel with 18 ft. from Richmond to the sea; and as the tide on this river is about 3 ft., it goes without saying that it is practicable to take 21 ft. from the

wharves of the William R. Trigg Co. to deep water in Chesapeake bay. This depth is sufficient to float all but the largest passenger steamers, fully equipped for use; and the majority of the vessels employed in the coasting trade of this country could be built in Richmond and floated to the coast, practically ready for service.

Industrial Combinations.

The census bureau has prepared statistics relating to the so-called industrial combinations as they existed during the census year ended March 31, 1900. Obviously this does not include several great combinations, including the United States Steel Corporation, and the statistics are only of approximate value. However, they are given for what they are worth.

"The statistics," the report says, "have been prepared to meet the popular demand for information regarding corporations organized in recent years by the consolidation under a single corporate management of a number of plants engaged in the same line of industry. When the census of manufacturing is completed it will be possible to show what percentage of the total products of manufactures in the census year was controlled by these industrial combinations, but at the present it is only possible to show the actual figures for these establishments. For the purpose of the census the rule has been adopted to consider no aggregation of mills an industrial combination unless it consist of a number of formerly independent mills. It has been found impossible to divide the capitalization so as to show only that portion which represents the manufacturing operations of these corporations, and care should be taken therefore not to regard this total capitalization as in any sense equivalent to the actual capital employed exclusively in manufacturing."

The list contains the names and addresses of 183 corporations, controlling 2,029 plants that were active during the census year, and also 174 plants that were reported as idle during that period, showing an average of eleven active plants to each corporation. Sixty-three of the 183 corporations treated as industrial combinations were organized prior to the



Mold loft, William R. Trigg Co., Richmond, Va.

year 1897, and ninety-two, or 50.3 per cent., were chartered from Jan. 1, 1899, to June 30, 1900. The authorized capitalization of the several corporations included in this report and the amounts of the capital stock issued are: Total authorized, \$3,607,539,200; issued, \$3,085,200,868; bonds authorized, \$270,127,250; issued, \$216,412,759; preferred stock authorized, \$1,259,540,900; issued, \$1,066,525,963; common stock authorized, \$2,077,871,050; issued, \$1,802,262,146.

The number of combinations in the various branches of industry when the census was taken is given as follows: Iron and steel and their products, forty combinations, 447 plants, \$341,779,954 capital; food and allied products, twenty-one combinations, 273 plants, \$246,623,623 capital; chemicals and allied products, fourteen combinations, 218 plants, \$175,002,887 capital; metals and metal products other than iron and steel, eleven combinations, eighty-nine plants, \$118,519,401 capital; liquors and beverages, twenty-eight combinations, 219 plants, \$118,485,158 capital; vehicles for land transportation, six combinations, sixty-five plants, \$85,965,963 capital; tobacco, four combinations, forty-one plants, \$16,191,898 capital; textiles, eight combinations, seventy-two plants, \$92,468,606 capital; leather and its finished products, five combinations, 100 plants, \$62,734,011 capital; paper and printing, seven combinations, 116 plants, \$59,271,591 capital; clay, glass and stone products, fifteen combinations, 189 plants, \$46,878,928 capital; lumber and its remanufactures, eight combinations, sixty plants, \$24,470,231 capital; miscellaneous industries, sixteen combinations, 118 plants, \$45,408,869 capital.

The arrangement as to production by groups brings the iron and steel industry at the head, with a gross product of \$508,626,482, which is more than double the value of the product of any other group, except that of food and kindred products, and represents nearly one-third of the gross value of products of all the industrial combinations. The total value of all the products of the industrial combinations reported is \$1,661,295,254, compared with total gross value of all manufactured products as shown by the census of 1900, \$9,372,437,283. The 183 combinations represented in the tables employed on an average 399,192 wage earners during the census year, to whom \$194,643,715 was paid. In addition employment was given to 24,585 salaried officials, clerks, etc., to whom salaries amounting to \$32,653,628 were paid. There was expended for miscellaneous expenses \$151,851,077. The total cost of materials was \$1,085,083,828.

THE EASTERN SHIP BUILDING CO., NEW LONDON, CONN.

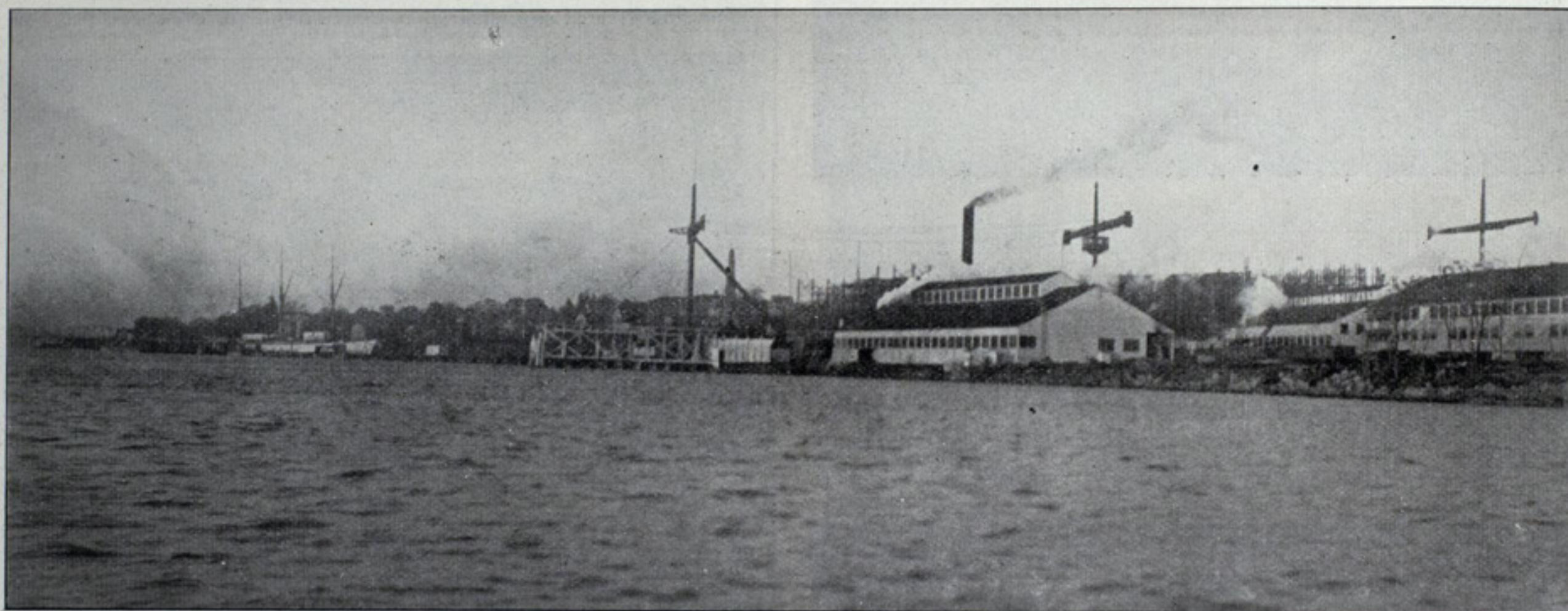


THE location of any business enterprise at once becomes the most important question that will ever engage its attention, and one that may be regarded as the safest test of the wisdom and sagacity of its projectors, a test which will invariably cling to its after history with that tenacious grasp, as no other will, because upon this single act alone will depend more than any other its success or failure as a business proposition. Gifts of bonuses have, in too many instances in the history of business development, become the deceptive shoals that mark the wreckage of a large majority of the 95 per cent. of business failures throughout the world. Judging by this well-known standard, the Eastern Ship Building Co., in locating its plant at New London at the eastern entrance to Long Island Sound, midway between New York and Boston, and on one of the finest harbors in the world, seems to have selected one of the best locations on the Atlantic coast, not only on account of its magnificent commercial facilities, but on account of its unchallenged facilities for the comfortable maintenance of its employes, a factor in business calculations that invariably must be reckoned with first, before such a thing as a dividend can ever be thought of; in fact, and so far, as this locality is concerned, it is seriously questioned if there is another of equal advantage to the working classes from "Quaddy Head" to the Florida reefs. And so it is expected that within a few years such a thing as a stringency in the supply of intelligent labor to build large ships will not be known at these works, for the company can, like the large educational institutions, turn out a class of mechanics sufficient for all its needs, without, for an instant, impairing a comfortable rate of compensation to every man in its employ. Advantages of this location over many others, besides those already suggested, are ample railroad facilities direct to its plant and

At certain parts of the structure where the heave of the sea will tend to strain the ship, the frames are double and made very strong. The outer surface of these frames is covered with a shell of steel plates averaging about 1 in. in thickness. These enormous plates are arranged to give a maximum of strength, and the riveting of them to the frames and to each other is receiving the utmost care.

These ships have a continuous longitudinal bulkhead on the center extending from the inner bottom to the main deck. The side plating of the shell with this longitudinal bulkhead form the three vertical members of the entire structure. The upper flanges of the girder are formed by the upper and main decks, which are laid with heavy steel plates. This great girder is designed to support a full cargo when suspended by long waves of the sea at either end. The side girders are kept in place by three intermediate decks between the tank and main deck, making in all five complete decks, each covered with heavy steel plate. The beams supporting all these decks are of channel steel, and fitted to every frame by large bracket plates. One of the many notable features in the construction of these vessels is the distribution of the water ballast. Various conditions of trim and safety can be obtained. The double bottom is divided longitudinally into three watertight divisions and transversely into about twelve, making in all 36 separate tanks. In addition to these there are the fore-and-aft peak tanks and side tanks between the main and 'tween decks, about one-quarter of the vessel's length from either end. The latter tanks are really fitted for the purpose of controlling the ship's stability and seaworthiness.

The vessels are divided transversely into thirteen watertight compartments, while the longitudinal bulkhead is watertight in the machinery



A general view of the plant of the Eastern Ship Building Co., New London, Conn.

access also by water to every port of the world at all seasons of the year.

The force now employed in the works is about 1,000 men of all grades, which force will be materially increased as the work on the vessels now under construction advances towards completion. The plant has so far been sufficiently equipped to enable the work on the vessels now under construction to proceed with an average degree of rapidity. And other improvements will be added as conditions and further contracts warrant. To construct its own propelling machinery in the future (the present engines are being built by the Midvale Steel Co. of Pennsylvania and the boilers by the Stirling Co.) will require a vast outlay for machinery and tools, and a probable increase of its working force to fully 5,000 men; all of which is expected to be accomplished within the next few years. The splendid trolley system now in use at this yard, and which has previously been noticed in these columns, is producing a telling effect in advancing the work under construction, consisting of two mammoth freight and passenger steel, twin-screw, ocean-going vessels, each of 21,000 tons, for Pacific service in connection with the Great Northern Railway.

STRUCTURAL FEATURES OF THE SHIPS.

The framing of these large vessels is being built on what is known as the longitudinal system. The great center girder, which in all vessels prior to these has been in the form of an I girder, is in form of a double II, or box; that is, these vessels have two vertical keels instead of one. The girder is of the same depth as the double bottom (6 ft.). On each side of this girder there are several other vertical longitudinal members having the plating on top, forming the tank top, and the shell plating below forming the bottom of the tank. This tank or double bottom is 6 ft. deep for the greater part of its length, and is increased at the extreme ends where it merges into the fore-and-aft peaks at the collision bulkheads. The whole of this space can be filled with water when desired, to sink the ship to a suitable draught when making a voyage without a cargo; or a very light one, at the same time allows the ship to keep afloat whenever the outer shell or "skin" has been punctured by rocks or by colliding with other vessels. This bottom girder or double bottom, forms the "backbone" of the ship from which the great frames spring or extend up to the weather deck, about 60 ft. above the keel. The frames are made of channel steel, spaced 30 in. apart, but as they near the extreme ends they are spaced closer and are composed of angle bars riveted together.

space, which makes in all fifteen watertight compartments. The engine rooms are completely independent of each other; so are the boiler rooms, but access is had from one to the other by watertight doors. The coal bunkers are situated above the boilers and so arranged that coal can gravitate direct to the stokehole floor. The method of pillaring is somewhat novel and has never been attempted before by any American ship builder. Indeed, as far as known, these vessels are the first to receive Lloyd's or any other classification society's approval for such a device. Strong girders run under the transverse beams and are supported at wide intervals by built stanchions. By this means the least possible trouble is experienced in stowing the cargo.

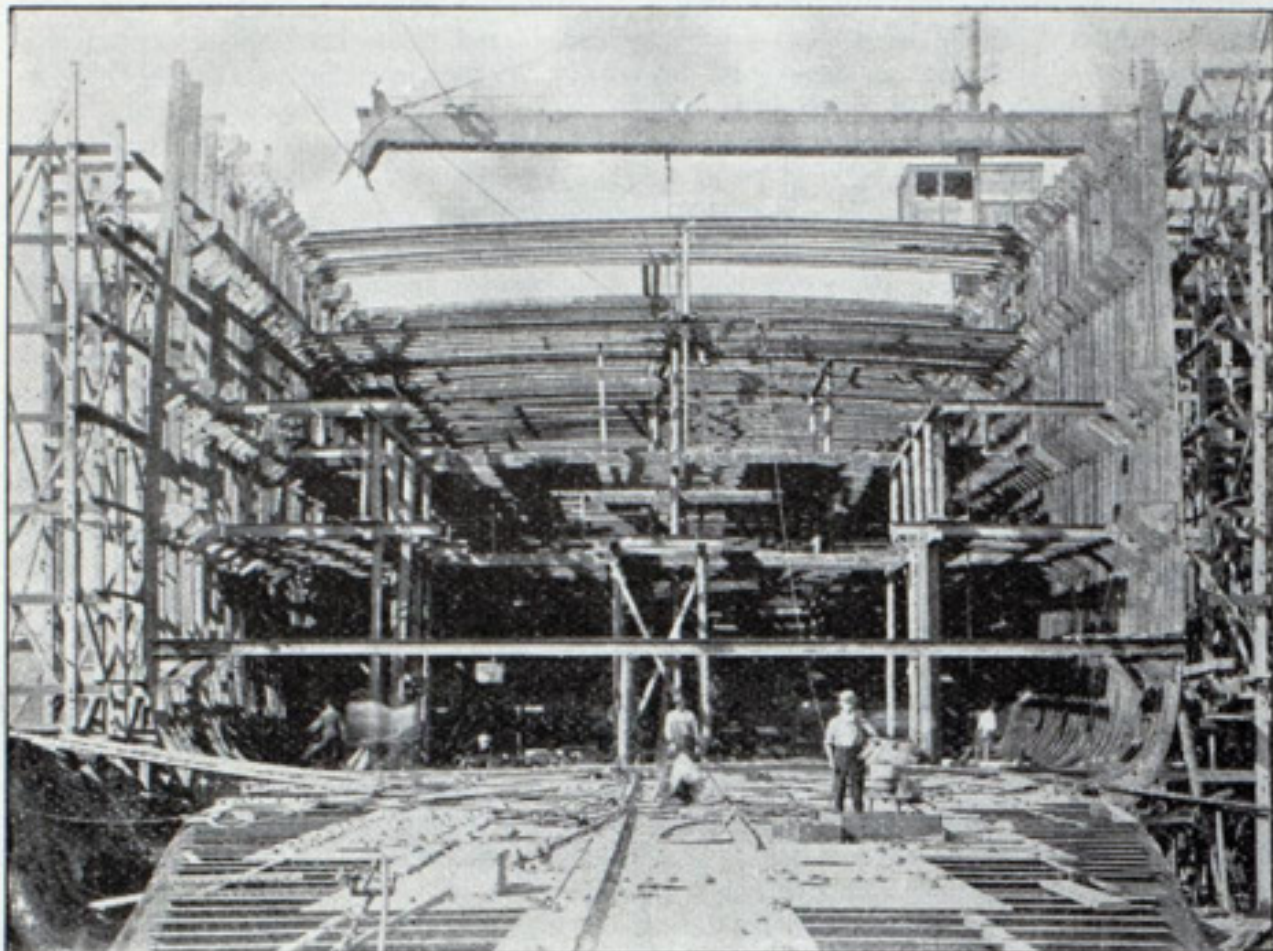
The finish and furnishing of all the cabins will be on a scale of elegance, taste and convenience that will command the admiration of the world for comfort and enjoyment of passengers. The vessels are designed to carry 1,500 passengers and about 300 officers and crew, and are to cost, when completed, in round figures, \$2,500,000 each. Both vessels will be launched during the coming year, to give place to others which it is said will be built on the same stocks.

Actual construction on these two ships was begun about March last, and the vessels are now nearly 50 per cent. completed, and some 13,000 tons of steel has already been worked. The building slips rest upon solid granite ledge, which at suitable declivity runs down to the bank of the Thames river. Opposite the yard there is over 60 ft. of water, and it is proposed to run the launching ways about 300 ft. from the shore line into the water. The vessels will be the heaviest ever launched. It is confidently expected that both of the vessels will be overboard before next fall. If this is the case the Eastern Ship Building Co. will certainly have made a record in rapid construction. It is said that already in one month 2,000 tons of material has been worked into these ships, or, in other words, sufficient steel to build two cargo steamers of about 300 ft. length.

OVERHEAD TROLLEY SYSTEM.

Locomotive cranes bring the material from the storage yard to the plate shop, overhead trolleys take the material from the shops to the ships, and over the ships is an admirable and ingenious arrangement for the rapid handling and transportation of steel material from the yard trolleys to any part of either of the two large building slips. This overhead system of handling material is of the wire rope cable-way type, with

a steel structure for tracks, the only compression members being the three masts and the shore strong back. All the guying and trussing is obtained by means of an elaborate net-work of steel wire rope guys. This system of handling material is the original conception of Mr. Charles R. Hanscom, the president of the company, and it has been very favorably commented upon by all American and European visiting naval architects, engineers and ship builders. The system permits of the handling of a large number of steel construction members at the same time, and one of the great advantages of the scheme is its flexibility and the number of usages to which the steel structure and guys may be placed. The carriages on the cable-ways are electrically operated, the operating machinery being located in a house under the cross-yard of the main mast.



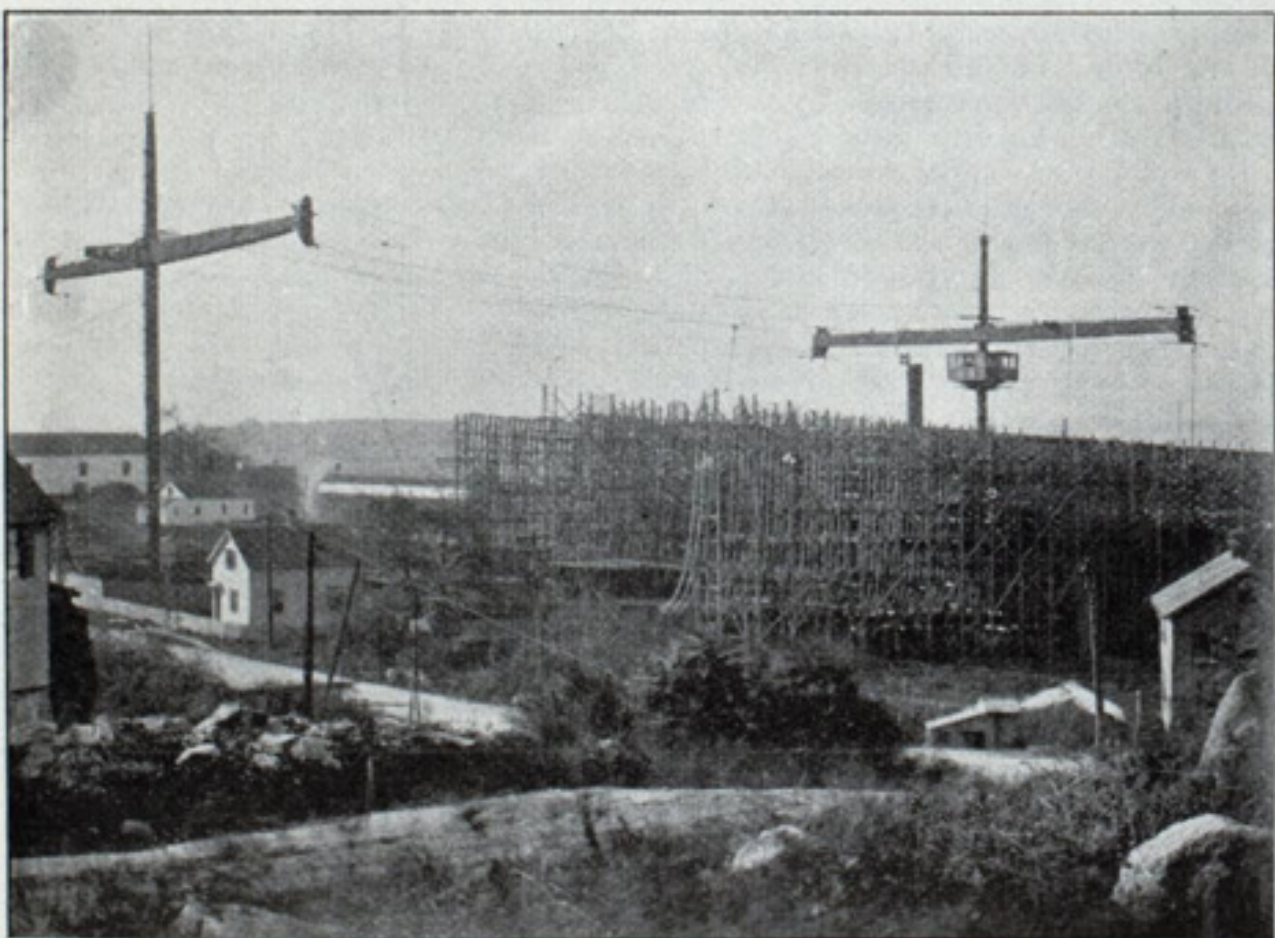
A recent view of one of the Great Northern Steamship Co.'s vessels.
Building by Eastern Ship Building Co., New London, Conn.

The entire structure, together with its operating machinery, was designed and built by the Eastern Ship Building Co.

Riveting, chipping, caulking, drilling and reaming on vessels building at the yard is done by pneumatic tools. Electricity is extensively used for winches, hoists and power purposes. All the machine tools in the shops are steam driven, two large condensing engines furnishing the power required. All the tools are modern and of approved type, the extra heavy Hilles & Jones punches, rolls and planers being of special interest.

DESCRIPTION OF THE SHIP YARD.

The works at present cover an area of about forty acres with a water frontage of about a mile. The ship yard plate shop is a fine commodious building containing 25,000 sq. ft. of floor space. In this shop are the largest steel shape and plate working tools in the country. Several massive Hilles & Jones punches, and the large plate bending rolls and planer attract attention. A special tool in this shop that is worthy of particular mention is the combination butt planer and scarfing machine, lately installed. It has been designed as an improvement on anything at



Traveling cranes at the works of the Eastern Ship Building Co., New London, Conn.

present in the market. At the south end of this shop is the laying-out shed, which, with about 8,000 sq. ft. of floor space, gives ample room for laying out plates during stormy weather. A plate conveyor runs from the side of these buildings to the ship building ways, this conveyor being specially designed to feed the ships. The plate shop contains horizontal and vertical punches, plate and angle shears, countersinking machines, drills, rolls, and planers of a capacity sufficient to machine 2,000 tons of material per month, when working but ten hours per day.

North of the plate shop are the furnaces, boiler house, blacksmith shop and bending floor. The boiler house and smith shop are in a well

designed brick building. There are about twenty forges in the smith shop, and the anglesmith work is deposited from the forges directly alongside the ship. The angle furnace is about 80 ft. long and will take the longest and largest ship's frame that will be used in ship construction for many years to come. The plate furnace is also roomy and well designed. The bending floor is so designed that double gangs are regularly employed on this work. In the boiler house there are four boilers of the return fire tube type, designed for natural and assisted draft, a large blower increasing the combustion when atmospheric conditions and a greater demand for steam necessitates its use. Between the boiler house and plate shop is the large air compressor house which contains two very fine Ingersoll-Sergeant duplex compound air and compound steam end compressors. These machines are the most economical that have been produced up to date. They furnish air at about 100 lbs. pressure to the large number of pneumatic tools used throughout the plant. Compressors are fitted with intercoolers and superheaters, and, together with the other steam engines in the plant, are worked condensing. A large surface condenser is placed in the air compressor house, this machine being of the Wheeler type.

On the east side of the laying-out shed is a large three-story building 250 ft. long by 70 ft. wide. The lower story is occupied by the carpenters and yard plan rooms; the second story is devoted exclusively to the joiners, whereas the upper floor makes a magnificent mold loft. This building is very heavily framed, resting on good rock and brick foundations with unusually heavy floor timbers. The mold loft is perfectly level, and one of the finest that has ever been built.

North of the mold loft and joiner shop is a three story office building, the superintendent's office and yard office being on the lower floor, the general business office on the second floor, and the drawing offices on the upper floor. This building covers a floor space 70 ft. long by 30 ft. wide.

The machine shop and pipe shop is a large roomy building 170 ft. long and 60 ft. wide. This shop contains several pipe machines, lathes, drills, planers, shapers and all tools necessary to do all the machine work required in such a plant. North of the machine shop is a large store house well located and arranged. East of the large plant buildings are the paint shop, wood finishing shops and joiner storage house, and on the wharves are the usual rigging and storage houses and sheds.

Maryland Steel Co., Sparrow's Point, Md.



The Lyra.

Since the last annual ship building edition of the Marine Review the Maryland Steel Co., Sparrow's Point, Md., has launched six vessels as follows: Three torpedo boat destroyers for the United States navy; one car float for the New York, Philadelphia & Norfolk Railroad Co.; one freight steamer for the Boston Towboat Co. and one steamer for the Boston Steamship Co., making the product for the year 1901, 17,720 gross tons. The yard has been remodeled and new tools, handling appliances, launching ways and wharves have been built. At present there are launching ways capable of taking four 650-ft., one 400-ft. and two 350-ft. vessels at one time, besides two of

smaller dimensions, making a capacity of nine vessels in all. These ways are served by derrick cranes, which are capable of handling all material required to be put on vessels of the above-named sizes before launching. The tool shed has been enlarged and various new tools installed, among them being 30-ft., electrically-driven, bending rolls and a scarfing shaper. Heavy vertical bending rolls have been placed in the boiler shop and a number of new tools in the machine shop.

One of the principal improvements under way at present at these works is the extension of the fitting-out wharf. There is being placed on each side of this wharf a traveling derrick crane of 15,000 lbs. capacity. These cranes have sufficient height and overhang to place material on any vessel, and in connection with the 125-ton shears on the wharf, will give most exceptional facilities for prompt work in fitting out vessels after launching.

The vessels now under construction have their principal dimensions given below:

	Truxton, No. 21. Whipple, No. 22. Worden, No. 23.	Shawmut, No. 35. Not Named, No. 36.	Missouri, No. 37. Maine, No. 38.
Owners	U. S. Navy.	Boston S.S. Co.	Atlantic Trans. Co.
Length over all	259 ft.	505 ft.	507 ft.
Breadth	23.2 ft.	58 ft.	58 ft.
Depth at center	14.7 ft.	.....	.....
Depth at side .....	.....	40 ft.	43 ft.
Trial displacement ..	433 tons	.....	.....
Loaded displacement ..	.....	17,200 tons	17,175 tons
Indicated H.P.	8,300	4,500	5,000
Speed	30 knots	12 knots	12½ knots
Class	Destroyer	Freight Stmr.	Freight Stmr.

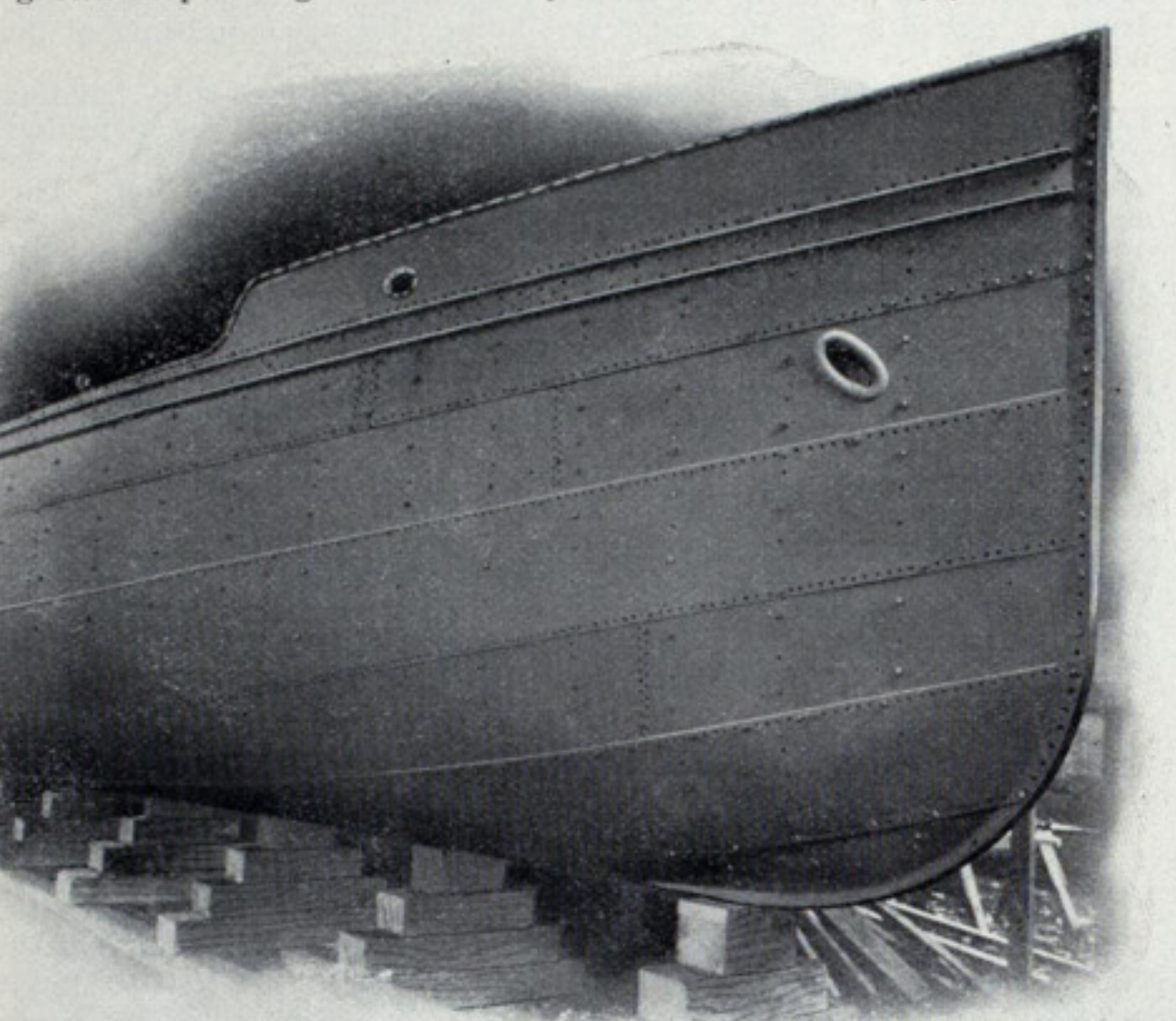
Messrs. Swasey, Raymond & Page, naval architects, announce the opening of their Boston office at which they are prepared to design vessels of all types, including passenger, freight and tramp steamers, coasting schooners, river and bay boats, tugs, barges, lighters and high-speed and ocean-going yachts. These three men have been connected with the leading ship yards of the country and have had a wide experience. Their office is in the Colonial building, Boston.

Congressman Allen has introduced a bill making an appropriation of \$85,000 for a second lightship for Portland harbor. The new vessel is wanted for the eastern approaches to Portland for the benefit of the European steamers.

New Plant of Marine Iron Works.

On the north branch of the Chicago river, extending from the docks back to Dominick street, near Clybourn and Southport avenues, the new plant of the Marine Iron Works is nearing completion. Encouraged by the rapid growth of their business in the last few years, the company decided some time ago that they must greatly increase their facilities, and were arranging to do so, when, on Sept. 24, a serious fire swept over the yards from the burning docks of the Dreiske Coal Co., across the river, and put an end to these plans. It was only, however, to make way for still more extensive enlargement, taking advantage of the opportunity afforded for rebuilding the entire plant.

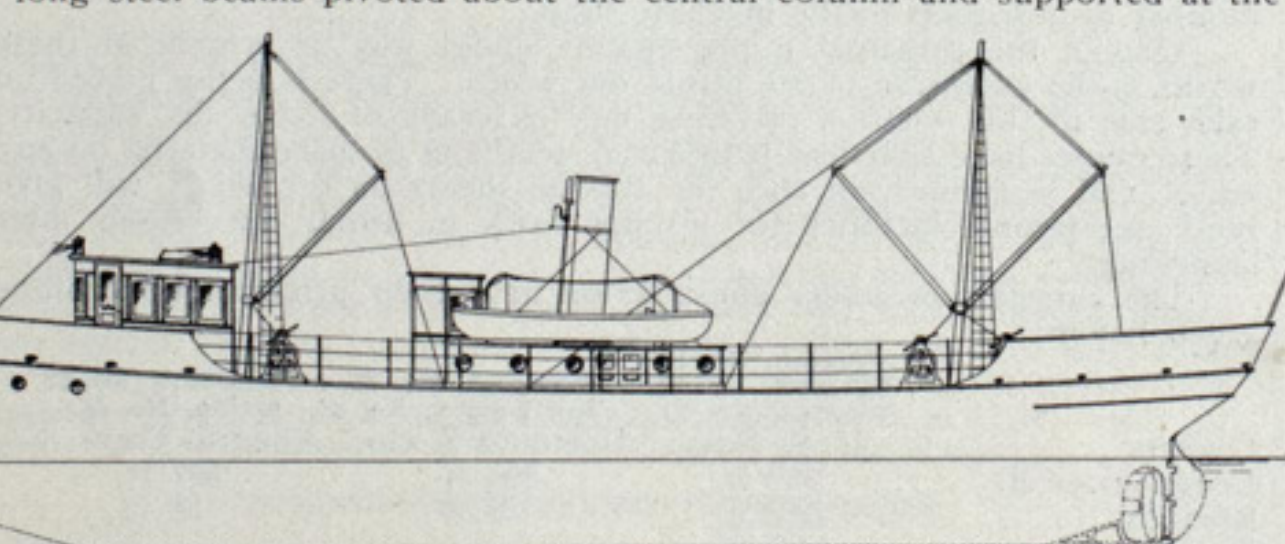
"C" street, running east and west, bisects the company's grounds. South of this, temporary shops were hurriedly erected with a view to their ultimate use as boat sheds. On the north, the new permanent buildings have been laid out. With a clean-swept field, no old machinery or outgrown shop arrangements to hamper them, and with many years of experience as a guide, the Marine Iron Works has succeeded in building a very complete plant, consistent in all its parts and thoroughly in accord with good modern practice in every detail.



In the machine shops an excellent line of high grade tools is being installed, arranged in separate groups, so that each piece of work will be handled to completion in its own particular section. It is intended that each of these groups of machines shall be driven by a separate motor supplied with current from a central dynamo service. The main groups are all placed along the north wall, and overhead carriers commanding the whole of this half of the floor space will serve them. The south half of the building presents a comparatively clear floor space, only a few special tools and machines for light work being set up there.

North of this building and parallel to it, with a driveway and the private switching tracks between, is the pipe shop and a department for water-tube boilers. This is flanked on the east by the general offices and drafting rooms and on the west by the boiler shop. The latter is a high square building, the roof being borne by a center post and Howe trusses. Two long steel beams pivoted about the central column and supported at the

outer end by rollers running on a circular track will sustain the overhead carriers. A line of track runs across the south end of the shop and out into the warehouses beyond. The overhead radial cranes will be able at the same time to take material off the hand-cars running from stock room to boiler shop, and deposit it near to the smaller jib cranes in front of each group of machines placed along the walls, and also to lift up the finished work from the center of the room and place it bodily on cars for shipment. In boat yard and boat shed there has been but little chance for arrangement as yet. Bending rolls and punches and shears, angle bending plates and parts for the new furnaces are set about in odd corners waiting for the shops to vacate their temporary quarters. There will evidently be a very complete plant for both steel and wood boat work. In fact, even under present adverse conditions, there is quite a little work going on.



The Marine Iron Works has been devoting its attention for some time to the "knock-down" construction of steel hulls, speed launches, tugs, passenger and cargo river steamers, especially the very shallow-draught stern paddle-wheel type. On this page are cuts showing some of the boats

they are building. A launch like the one shown has just been completed, and is now on its way in crates and boxes to the west coast of South America. Of wood hulls there is an 80-ft. steam yacht, for use on the St. Lawrence, that is now in frame and about half planked, and work is just commencing on a double-decked stern paddle-wheel river steamer for the inspection service of a foreign government.

To further insure the success of its new plant, the Marine Iron Works has been fortunate enough to secure in addition to the veteran services of its general manager, Mr. W. G. Nourse, and superintendent, Mr. W. H. Bates, the assistance of an able naval architect, Mr. John G. Kreer, who will devote his time entirely to the technical work of the company. Mr. Kreer, after graduating from college in this country, received his technical education at the royal school of naval architecture, Berlin-Charlottenburg. Completing the four years' course of study there, he was first employed as a naval architect in Hamburg, and then had the exceptional advantage of serving as assistant engineer to Johann Schuette at the experimental model basin of the North German Lloyd in Bremerhaven. Mr. Kreer says: "I find my experience at the model basin of great value to me in designing. The actual observation of the effect on its resistance of slight changes in lines of a model impresses on one the factors that go to make a speedy ship in a way that no amount of theorizing can accomplish. Whatever may be said of the absolute value of the data obtained, their relative value is beyond all question. I should have been glad perhaps to stay there longer, but there was a great deal of government work carried on (the German navy department has not yet completed its own model basin) and I dare say they were quite justified in not wanting a foreigner to know so much about their plans as my position there necessarily entailed."

Mr. Kreer is manifestly well informed in everything pertaining to his profession, and entering into his new work very enthusiastically, will unquestionably prove of great influence in the increasing success of the Marine Iron Works.

Test of Steam Pipe Coverings.

Mr. Geo. H. Barrus, consulting steam engineer of Boston, some time ago installed at the Manhattan Railway Co.'s new power house, Seventy-fifth street and East river, New York city, apparatus for testing the relative efficiency of non-conducting pipe coverings. The test was a thoroughly practical one, extending over sufficient time to give results that might be relied upon. It was concluded about the time of the last annual meeting of the Society of Naval Architects and Marine Engineers in New York, and members of that body, as well as many other engineers, were invited to the power house to inspect the arrangements under which the test had been conducted and to hear Mr. Barrus' conclusions. Mr. Barrus on that occasion read a paper which follows:

These pipe covering tests were planned with the object of ascertaining the efficiency, both comparatively and absolutely, of some of the leading coverings as ordinarily manufactured, sold, and applied. I mean by the term "efficiency," simply that efficiency which measures the degree to which the covering serves to prevent radiation of heat from the outside of the pipe, or what is the same thing the degree to which the covering prevents the condensation of steam in the interior of the pipe.

The plant is divided into two sections, one for coverings designed to stand the highest pressures which are now regularly carried by the modern power plants, say 150 lbs. per square inch, and the other for lower pressures, such as have been in vogue for many years past, say 80 lbs. per square inch. It was sought to install a testing plant for the purpose in view that should be on a sufficiently large scale to approximate to practical conditions of service, rather than make it a laboratory apparatus and a laboratory test which characterizes much of the work heretofore done in this field of testing. That the work might also be carried out on a commercial scale it was sought to make and continue the tests a sufficient number of hours continuously in a day and a sufficient number of days in succession that no question could be raised as to the reliability of the data from too short duration, or from want of continuous repetition. Many of the coverings have therefore been tested day after day for a period of a month, and every one has been subjected to at least three days run from eight to nine hours continuous test each day.

The size of pipe selected for the leading tests is the ordinary standard 2-in. steam pipe; and the length selected, 100 ft. for each pipe. That the effect of size of pipe on the results might be studied and exhibited, and at the same time the work brought into line with the practice of high-pressure power plants, especially as regards much of the engine and boiler room piping, two 10-in. pipes each 35 ft. in length form a part of the 150-lb. section of the apparatus. The 2-in. pipe in the 80-lb. section of the plant are numbered for reference 1, 2, 3, 4 and 5. The 2-in. pipes in the 150-lb. section are designated 6, 7, 8, 9 and 10; and the 10-in. pipes are numbered 11 and 12. To facilitate the handling of the apparatus and the ready collection and measurement of the water of condensation discharged from the pipes, the steam is first supplied to a central point on one of the long sides of a rectangular room, about 130 ft. long and 22 ft. wide, and the various pipes lead from this point outward to the two ends of the room, and thence, after turning, they are brought back to points near the center where the various collecting casks and weighing scales are conveniently located. Although the pipes in each section set out from the same point, or rather from points in line with each other above the header, they do not arrive at their destinations of discharge in a similar line with each other, because in making the turn and return at the end of the room the outside pipes have the longer distance to cover. The 2-in. pipes are laid out 16 in. from center to center, or 5 ft. 4 in. from the center of No. 1 to the center of No. 5. The same from the center of No. 6 to the center of No. 10. Consequently, the drip end of No. 5 pipe is 21 ft. 4 in. farther from the center line of the room than that of No. 1 pipe; and likewise the drip end of No. 10 pipe is 21 ft. 4 in. farther from the center line of the room than that of No. 6 pipe. The two 10-in. pipes are parallel to each other and a straight run. They are consequently arranged in a precisely similar manner throughout.

The main object so far as the getting of the principal data is concerned is to properly secure and measure the water formed by condensation of the steam in the pipes. Precautions must be taken first to insure a supply of steam to the pipes free from water at the start, or in other words, dry steam; second, suitable inclination or pitch of the pipes to

insure the drainage of all the water formed by condensation to the drip-ends or the points where it is discharged into the collecting casks; third, the thorough venting of the drip-ends of the pipes to prevent the collection of air in the interior, and fourth, the proper collection and measurement of all the water discharged. To secure dry steam at the start, the steam from the boiler first enters the central separator, which is merely a vertical 6-in. pipe, drained at the bottom by a steam trap, the steam entering through a 2-in. pipe at the top, which descends inside about 18 in., the steam, freed of its water, passing off at the two side branches which are each of the 2-in. size. Before entering either header the steam passes through another separator, which is likewise a 6-in. vertical pipe, drained at the bottom by a $\frac{3}{4}$ -in. valve, the entering steam likewise descending through a 2-in. pipe a distance of about 18 in., and the dried steam passing off at the side into the end of the 6-in. header. As a further precaution the outer or dead end of either header is drained by a $\frac{3}{4}$ -in. pipe, connecting into the main drain pipe above the valve, and attached to the vertical portion of this pipe is glass gauge to reveal to the eye any collection of water inside. Beyond all this, a steam calorimeter is attached to the side of either header, the sampling pipe of which draws from the center of the interior space. Starting with dry steam in the headers, which are protected by hair felt and canvas, a supply of dry steam to the pipes is secured by connecting to the top of the header and taking the steam in each case through a 2-in. angle valve. The proper drainage of the water formed by condensation in the test pipes is secured by pitching them from the inlet end to the discharge end. The 2-in. pipes have a total drop from one end to the other of 16 in. The 10-in. pipes have a total drop of 6 in. The venting of air is secured by the attachment of a $\frac{1}{4}$ -in. air pipe to each drip end, at a point about $\frac{1}{2}$ in. above the line of the bottom of the pipe inside.

The drip end of each test-pipe is provided with a vertical drain pipe of the $\frac{1}{2}$ -in. size, provided at the bottom with a $\frac{1}{2}$ -in. globe valve. Attached to the pipe above this valve is a glass water gauge. By means of this glass gauge, which is an all-important appendage to each pipe, a knowledge is had of the exact state of the water condensed in the pipe, and by suitable regulation of the discharge valve the water can be kept drawn down continuously to the desired mark, and all the water discharged to the weighing cask as fast as it collects. To facilitate the easy regulation of the discharge water, a second discharge pipe of the $\frac{1}{2}$ -in. size is attached to the drip end of the lower gauge fitting and this is provided with a $\frac{1}{8}$ -in. globe valve. The main dependence for the discharge of water into the casks is placed upon this pipe, and its outlet descends to within 6 in. of the bottom. That all the water discharged under the pressure to which it is subjected in the test-pipe may be recovered without loss of evaporation when the pressure is relieved, the cask is partly filled with cold water at the beginning of a test, and the highly heated water is quickly cooled. Each cask rests on an independent platform scale which reads to $\frac{1}{4}$ lb. and the rate of condensation in the pipe for any interval of time, such as a half hour, or an hour, is the increase of weight shown on the scales for that period of time. It will be observed that a considerable blow of steam occurs from the vent pipes. This is steam in every case and not the water of condensation from the test pipe and it insures the complete "ventilation" so to speak of the interior.

So much for the leading features of the plant. Taking up next the coverings themselves: These, I would say first, were bought in open market, and I believe them to be what they were by this method of purchase intended to be, samples of the coverings which are ordinarily supplied by the various manufacturers in the ordinary course of business. They were applied by workmen familiar with the application of pipe coverings, under intelligent supervision, and in my opinion well butted, jointed and secured. During the progress of the tests they have been frequently pointed up with cement where the joints through continued service have become defective, the same as would be done by the repair force having the care of a steam plant in commercial service which is well kept up. Before the conclusion of the tests opportunity was given the representatives of each covering to visit the plant, examine his goods, criticize their application, and where defective, correct the defects. It may be said, here, that where such defects have been found and corrected no appreciable improvement was produced, thus showing that the coverings were already well applied.

In planning the tests of the 80-lb. section of coverings two methods have been pursued. The four pipes, Nos. 2, 3, 4 and 5, have been tested with four different coverings, each of which has been in use without removal during the entire time of the tests. With the exception of one week, these coverings have been under test 8 to 9 hours per day, each day of the week throughout. On the contrary, No. 1 pipe has been used for testing the same class of coverings, and one or two in addition, for shorter periods. First, the same class of covering as that on No. 5 pipe has been applied to No. 1 pipe and tested about a week. Then the same class of covering as that on No. 4 has been substituted and tested the second week, then the same as No. 3 the third week, and so on, thereby applying one by one the various coverings to the same pipe, and so far as attainable subjecting it to the same surrounding conditions. To a limited extent the same system has been followed on the 150-lbs. section of 2-in. pipes, the endeavor being to obtain sufficient data to enable a reliable conclusion to be drawn regarding the effect of all differences of condition. The tests have started each morning with pipes empty and pipes and coverings cold. A period of $1\frac{1}{2}$ hours has usually sufficed to thoroughly heat the coverings, and after that time for 7 to $7\frac{1}{2}$ hours uniform conditions as to rate of condensation have prevailed. At the end of the day's run, the steam has been shut off from the headers, the pressure allowed to fall, and just before the pressure reaches zero the $\frac{1}{8}$ -in. drips are blown out and the water remaining in the pipes drained into pails through the $\frac{1}{2}$ -in. valves, the pails being subsequently emptied into the casks. All the water resulting from the preliminary heating of the pipes and coverings and the draining of the apparatus at the end is collected and weighed in the casks, in addition to that condensed during the period of normal conditions. Half-hourly observations are made of the weight on each scale, so that the condensation due to the preliminary heating can be separately determined, and the record of the test ascertained for any smaller period desired than the whole day's run.

The temperature of the air surrounding the pipes is shown by thermometers in japanned-cases which are suspended 24 in. below the coverings and distributed in various parts of the room; and the condition of

the air as regards humidity is shown by wet and dry bulb thermometers. The pressure in each of the two sections of the apparatus is shown by the gauges attached near each header, and the temperature of the steam by two thermometers placed in wells which are sunk within. The temperature of the water discharged from the pipes is shown by thermometers in No. 1 and 6 discharge pipes. The temperature of the outside surface of the coverings has been found by laying the bulb of a thermometer alongside the covering and protecting it from outside influence by a thick layer of hair felt tied on. Pans of water well protected by hair felt have also been used, encircling the upper half of the pipe, and their temperature taken.

All the various instruments referred to have been observed during the test at uniform time intervals, so as to obtain average records of the attending conditions; and if you will examine the apparatus you will see their various locations. The presence or absence of air currents about the pipes has been frequently tested by using a delicate anemometer, pointed in various directions, but as a result of these observations no current has at any time been found of sufficient force to move the fan in the least.

These tests have, as a rule, been made with pipe having dead ends and with no circulation of steam through the pipe except that required to supply the loss by condensation, and the small amount escaping at the air-vent, in no case being in excess one-half of one horse power of steam for any one of either the 2-in. or of the 10-in. pipes. To determine whether this method of test is applicable to the ordinary conditions of service where steam is moving through the pipe at a far greater velocity, pipes No. 1 and 6 were fitted at their drip ends with steam discharge pipes arranged, as can be seen by inspection, so as to obtain any desired current through the pipe without carrying away with the steam discharged any of the water condensed. The amount discharged was determined by passing the steam through a horizontal orifice $\frac{1}{2}$ in. in diameter, and maintaining above it a pressure of about 15 lbs. by the gauge. This makes a current through pipe No. 1 having a velocity of about 18 ft. per second. It was found, as a result of tests made first with no current and then with the steam moving at the velocity mentioned, that the rate of condensation was unaffected, being the same with moving steam as it was with comparatively dead steam, and this was true whether the pipes were covered or bare.

The lowest rate of condensation obtained on any of the 2-in. coverings of the 80-lbs. section has been a total for the entire pipe of 13.46 lbs. per hour, and the highest, 15.14 lbs. The lowest on any of the 2-in. coverings of the 150-lbs. section has been 10.47 lbs. per hour, and the highest, 14.00 lbs. per hour. The lowest on any of the 10-in. coverings is 10.67 lbs. per hour, total for the entire pipe and the highest, 15.93 lbs. All these figures apply to the average rate for a period of 7 or $7\frac{1}{2}$ hours continuous run. The minimum and maximum rates of the coverings tested are given in the appended tables, together with the condensation in the bare pipes:

The order of efficiency, with 2-in. coverings, 80 lbs. pressure, was Johns' asbestocel, New York air cell, Carey's moulded, Johns' moulded, Gast's ambler air cell. With the 2-in. coverings, 150 lbs. pressure, the order was Johns' asbesto-sponge hair felt three-ply, Johns' asbesto-sponge hair felt two-ply, asbesto-sponge felted (sectional), K. & M. magnesia (85 per cent. carb. of magnesia), asbestos fire felt (navy brand). With the 10-in. coverings, 150 lbs., the order was Johns' asbesto-sponge felted, K. & M. magnesia (85 per cent. carb. of magnesia), asbestos fire felt (navy brand), Watson's imperial.

The minimum and maximum rates of condensation per hour for each of the coverings tested was as follows:

TWO-INCH COVERINGS, 80 LBS. PRESSURE.—LGTH. OF TEST PIPES, 100 FT.

Johns' asbestocel	13.46	14.07
New York air cell	13.88	14.14
Carey's moulded	14.18	15.00
Johns' moulded	14.15	15.07
Gast's ambler air cell	14.60	15.14

TWO-INCH COVERINGS, 150 LBS. PRESSURE.—LGTH. OF TEST PIPES, 100 FT.

Johns' asbesto-sponge hair felt three-ply	10.47	10.93
Johns' asbesto-sponge hair felt two-ply	11.21	11.29
Asbesto-sponge felted (sectional)	11.20	11.57
K. & M. magnesia (85 per cent. carb. of magnesia)	11.64	12.20
Asbestos fire felt (navy brand)	13.18	14.00

TEN-INCH COVERINGS, 150 LBS. PRESSURE.—LENGTH OF TEST PIPES, 35 FT.

Johns' asbesto-sponge felted	10.67	11.07
K. & M. magnesia (85 per cent. carb. of magnesia)	13.00	13.64
Asbestos fire felt (navy brand)	14.00	14.64
Watson's imperial	15.79	15.93

BARE PIPES.

Two-in., 80 lbs. pressure	55.75	60.30
Two-in., 150 lbs. pressure	71.78	72.20
Ten-in., 150 lbs. pressure	105.9	112.
Temperature air of room (approx.)	50.	75.

Engineering and Commercial School.

The engineering and commercial schools so popular with young men who have not the means of procuring an education at any of the large colleges, or who find it necessary to engage in regular employment of some kind while pursuing their studies, are becoming very popular in lake cities. Buffalo has a school of this kind that is of rather broad scope. It is known as the Buffalo Commercial & Electro Mechanical Institute and is located at No. 329 Broadway. W. M. Wood is the principal. In addition to the courses indicated by the title, which includes electrical and mechanical engineering, business and shorthand, there are special courses for marine and stationary engineers and firemen.

The Morse Iron Works & Dry Dock Co., Brooklyn, N. Y., has closed a contract to repair the Austrian steamer Styria and alter her into an oil carrier or tank steamer. The Styria was damaged by striking on the Florida Keys in March last while on the voyage from New Orleans and Trieste. She was subsequently purchased at Key West by L. Luckenbach, who had her towed to New York.

The Bath Iron Works, Bath, Me.

The Bath Iron Works, Bath, Me., has had better success than its competitors in turning out torpedo craft. It has completed its contracts with the government and delivered the boats. At present the company has under way the United States battleship Georgia, the protected cruiser Cleveland, the harbor defense monitor Nevada, an ocean-going steam yacht for Mr. A. S. Bigelow of Boston, and a big steel barge for New York parties of the following dimensions: Length, 315 ft.; breadth, 46.3 ft.; depth, 29 ft. On the present page is a photograph of the Biddle, built by this company, making 28.5 knots per hour. The principal dimensions of the boat are: Length, 157 ft.; beam at deck, 15 ft. 6 in.; depth, 10 ft. 9 in.; mean displacement on trial, 168 tons. The propelling machinery of the Normand type consists of two vertical, inverted, three-cylinder, triple-

Defects in Torpedo Craft.

Defects discovered in the sixteen torpedo boat destroyers and twelve torpedo boats, built recently or still under construction for the navy, will probably result in a thorough overhauling of these craft to remedy their faults. The chief trouble lies in over-displacement, which will necessitate a considerable curtailment in the weight of the ordnance, engineering and equipment departments. A special board of naval officers has recently investigated the condition of these destroyers and torpedo boats and it was this board that discovered the defects. They say that not one of these vessels is within the contract displacement and that other defects exist which would render the boats below the contract standard in important details. Some of the vessels are said to be forty tons over the required displacement. As speed is the important requirement in a torpedo boat, overweight is necessarily a serious defect. Owing to the necessity

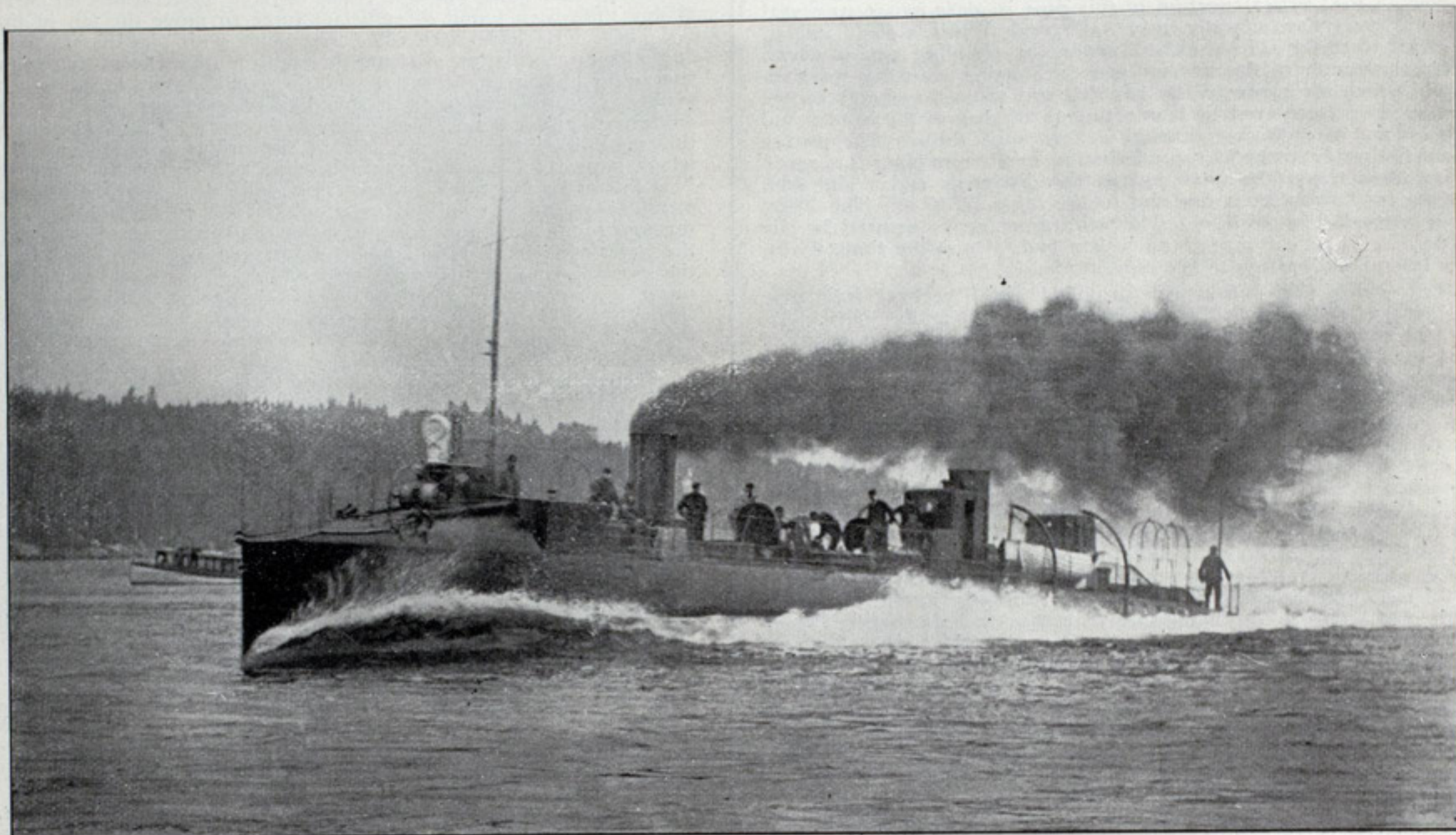


Photo copyrighted by C. R. Higgins, Bath, Me.

Built by Bath Iron Works, Bath, Me.

UNITED STATES TORPEDO BOAT BIDDLE ON HER TRIAL TRIP MAKING 28.5 KNOTS.

expansion engines, operating twin screws. The size of the engines are: High pressure cylinder, 17.22 in.; intermediate pressure, 24.78 in.; low pressure, 37.37 in., with a common stroke of 21 in. There are two Normand water-tube boilers, each having a grate 9 ft. 6 in. long and 6 ft. 3 in. wide, with a heating surface of 2,800 sq. ft., supplying steam to the engines at a pressure of 230 lbs. to the square inch.

Steam Yacht for Capt. Vernon C. Seaver.

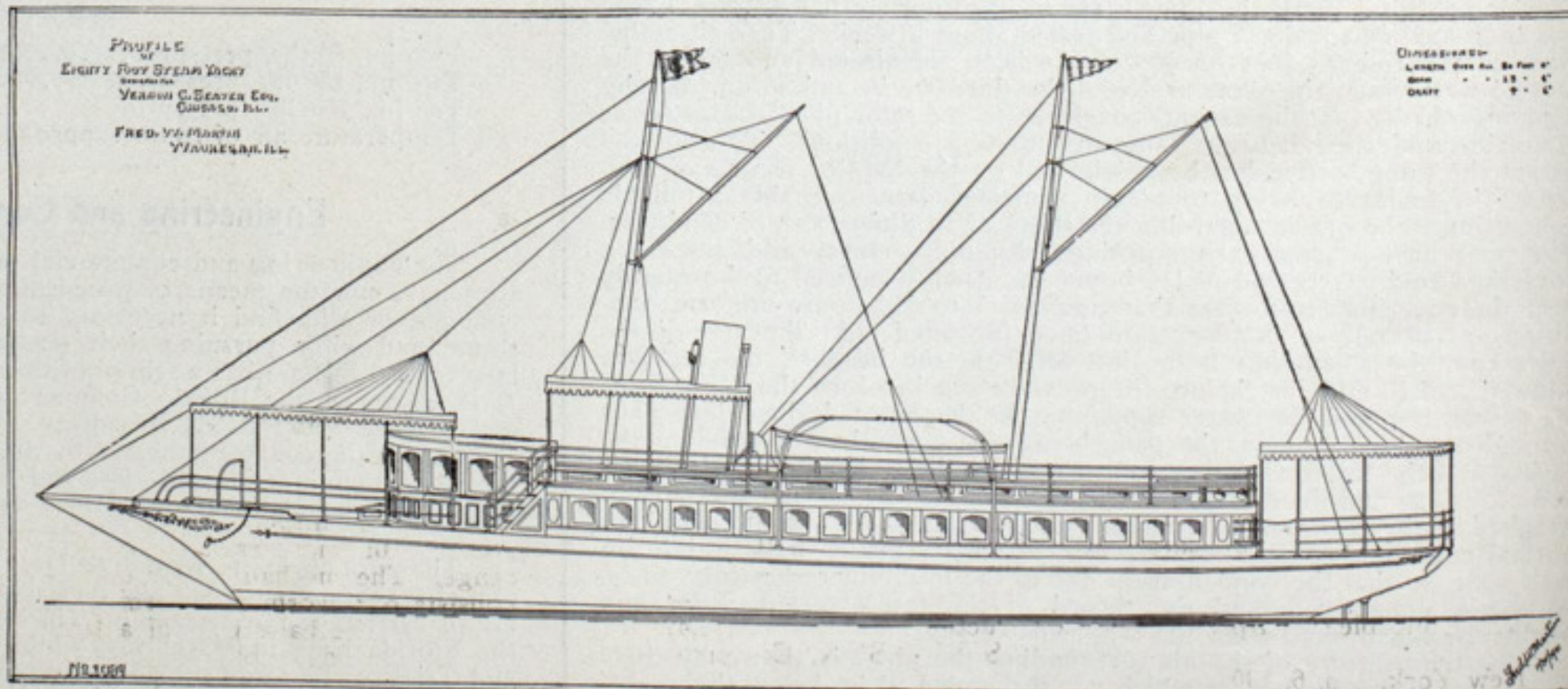
Capt. Vernon C. Seaver has let contracts for a beautiful new steam yacht to be built and ready for delivery not later than May 15, 1902. The vessel is to be 80 ft. over all, 13 ft. 6 in. beam and 4 ft. 6 in. draught. She will be equipped with a Willard fore-and-aft compound engine and a Dearing water-tube boiler capable of generating 200 H.P. The speed is guaranteed at 15 knots per hour. The yacht is to be lighted by electricity and will have electric fans and searchlights. The planking of the hull is to be 1 1/4-in. oak with steam bent ribs and trusses. The design is quite beautiful with a long overhang at the stern and a swelling transom. The bow will be an overhang bow and it might be called a combination between the extreme overhanging clipper bow and a lean type of modern sailing yacht bow. While comfort is not sacrificed for speed, every precaution is being taken in the design to have a very fast boat. The vessel is to be built by Mr. Henry Burger, Jr., of Manitowoc, Wis., who has built quite a number of the Goodrich line boats. The cabin, saloon and staterooms are to be finished in mahogany, the saloon to contain a piano equipped with electric attachment supplied from storage batteries. Adjoining the owner's stateroom will be a marble bathroom with marble walls and tile floor. The galley is to be thoroughly equipped and a refrigerating plant installed in connection therewith of 1/2-ton capacity.

for reducing weight, quarters for officers and men will be curtailed and this will give a smaller complement for each vessel than was contemplated. Admiral Bowles, chief naval constructor, estimates that it will be at least eighteen months before the boats will be ready for delivery.

The National Bridge Co. of Oswego, N. Y., has received an order for a new bridge to be erected in that city at a cost of \$184,000. The plans call for the use of the Scherzer rolling lift which the National company has secured the rights for in Oswego.

The Norfolk & Southern Co. has been incorporated at Trenton, N. J., to do a general steamship business with a capital stock of \$1,500,000. The incorporators are Thornwell Mullaly, New York; Ernest B. Hoes, Yonkers, N. Y., and K. K. McLaren, Jersey City.

The battleship Illinois has just been docked in the floating dry dock at Algiers.



STEAM YACHT FOR CAPT. VERNON C. SEAVER.

Panama Canal Offered for \$40,000,000.

A formal and definite proposition has been made by the French shareholders to sell the Panama canal to the United States government for \$40,000,000. The proposition was submitted to Admiral John G. Walker, president of the Isthmian canal commission, by M. Boeufvé, a member of the French embassy, who acted under instructions from the responsible officials of the Panama Canal Co. in Paris. Admiral Walker immediately called on Secretary Hay, and officially made known to him the receipt of the proposition, and Secretary Hay soon laid it before President Roosevelt. In substance the notification delivered to Admiral Walker was as follows:

The Panama Canal Co. declares itself ready to transfer to the government of the United States, on payment of \$40,000,000, its properties and concessions, estimated at that amount by the Isthmian canal commission, in conformity with the terms and conditions of the estimates of that commission.

While this offer has all the binding force required to put the transaction on a plain, strict business basis, still it is understood that no official representations will be made from Washington to the Panama canal officers in Paris until there has been a full and free discussion of the subject here between Admiral Walker and other members of the Isthmian canal commission on one side and M. Edouard Lampré, secretary general of the French Panama Canal Co., and M. Boeufvé, on the other side.

That Admiral Walker and most of his associates on the Isthmian canal commission will favor the acceptance of the offer there is very little room for doubt, since in their recent report they fixed the value of the French property at the figure at which the Frenchmen have agreed to dispose of it outright to the United States. The fact is, as pointed out in these dispatches last night, that a careful reading of the commission's report shows a stronger leaning to the Panama route than to the Nicaragua route, and the spirit of the report is declared by many capable judges to be an ingenious argument all the way through for the Panama project. Whether or not the commission will amend its report for submission to congress is another question, which probably will be determined entirely by the wishes of the president and secretary of state.

Steel Corporation's Earnings.

Wall street took a great deal of interest in the meeting of the directors of the United States Steel Corporation Tuesday afternoon at which the regular quarterly dividends were declared—1 per cent. on common and 1 3/4 per cent. on preferred—and a statement was given to the public of the corporation's net earnings for the quarter and for the nine months of the corporation's existence. For a number of days the prices of the steel stocks had been advancing upon rumors that the report would be a favorable one. Following is the statement of the Steel Corporation made public by Chairman E. H. Gary after the meeting:

Net earnings of all companies from operations for nine months ending Dec. 31, 1901, viz.:

April	\$7,356,744
May	9,612,349
June	9,394,747
July	9,580,151
August	9,810,880
September	9,272,812
October	12,205,774
November	9,795,841
*December (estimated)	7,750,000

Total \$84,779,298

Less amounts set aside for the following purposes, viz.:

Sinking funds on U. S. Steel Corporation Bonds and bonds of subsidiary companies.....	2,263,292
Depreciation, reserve and contingent funds and improvements	9,695,702
	11,958,994

Balance \$72,820,304

Nine months' interest on bonds..... 11,400,000

Balance \$61,420,304

Nine months' dividends on stocks, viz.: United States Steel Corporation:

Preferred, 5 1/4% (7% annually).....	\$26,752,894
Common, 3% (4% annually).....	15,227,812

Total \$41,980,706

Outstanding stocks of subsidiary companies..... 25,101

42,005,807

Balance applicable to surplus or new construction... \$19,414,497

E. SHEARSON, Comptroller.

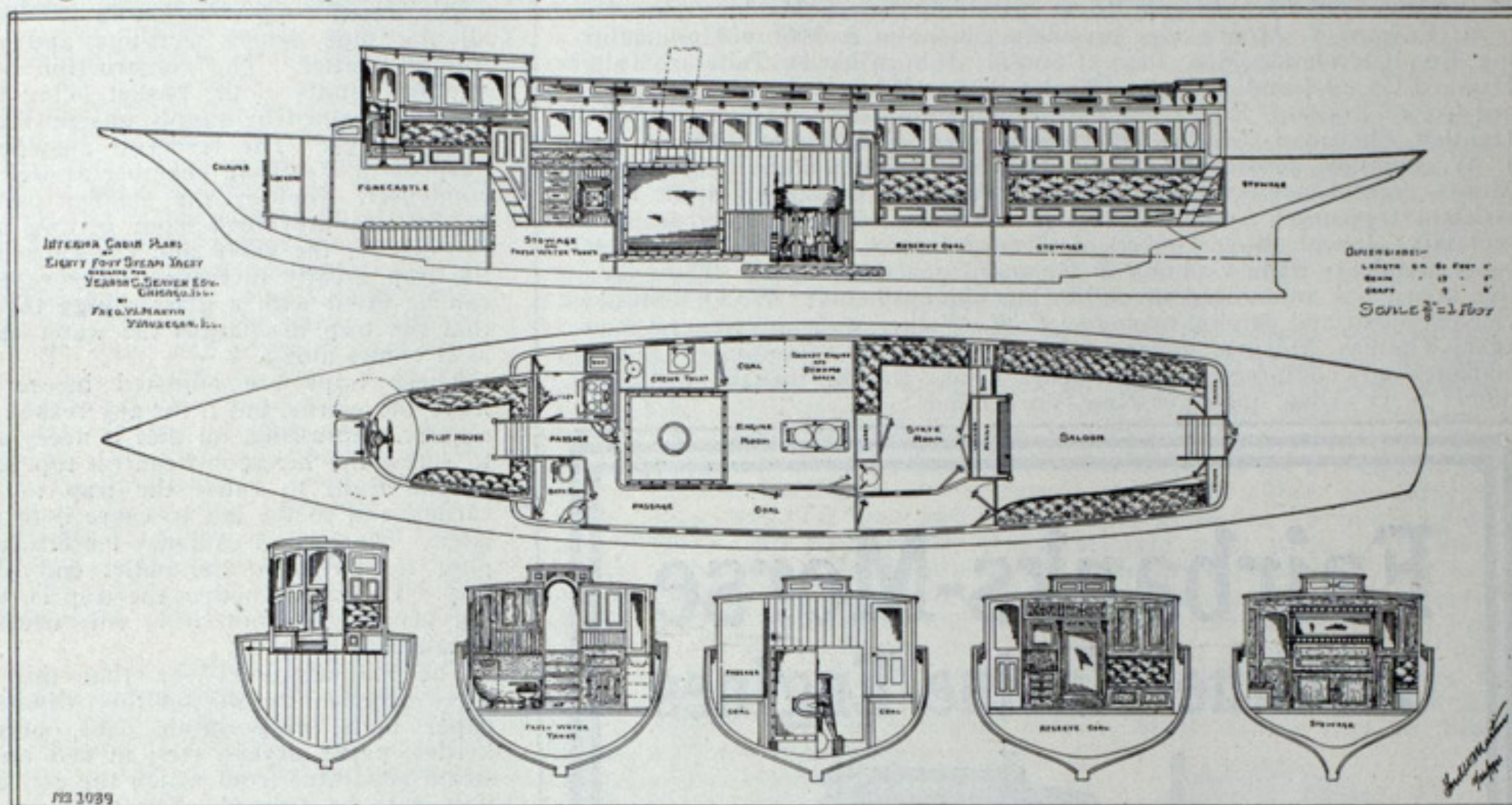
New York, Jan. 6, 1902.

*During the close of lake navigation, from December to April, inclu-

sive, the earnings of mining and transportation companies are, of course, diminished.

The preferred dividend is payable on Feb. 13. Books close Jan. 25 and reopen Feb. 18. The common dividend is payable on March 21. Books close Feb. 27 and reopen March 22. The books will close for the annual meeting on Jan. 25 and reopen on Feb. 18.

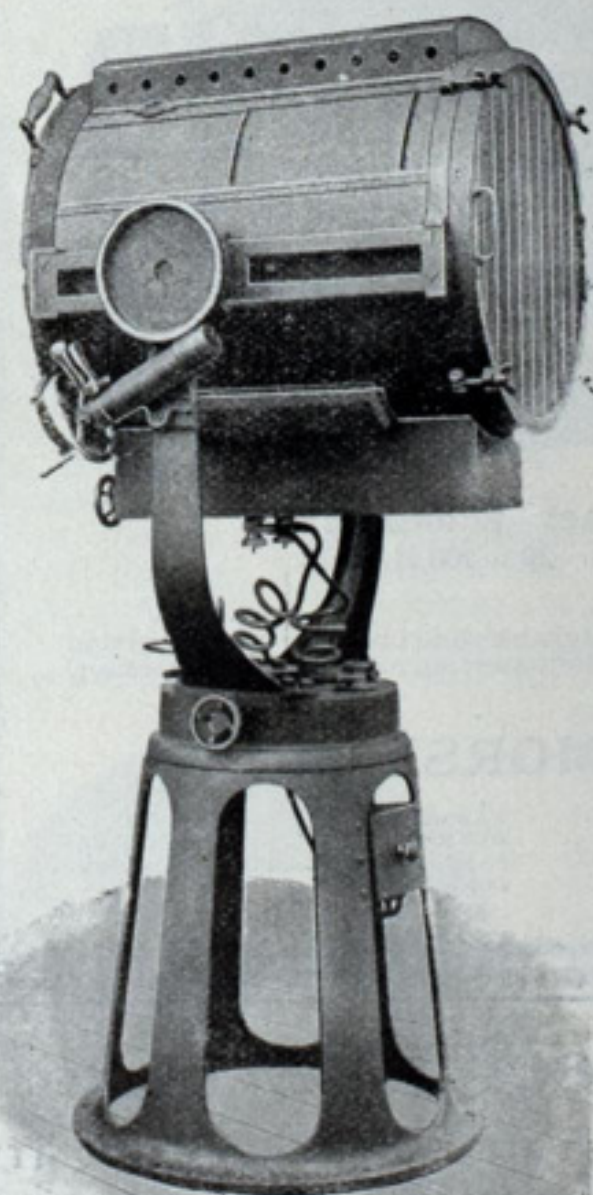
Sixteen out of the twenty-four directors of the Steel Corporation were at the meeting, which lasted nearly an hour; those present included: G. W. Perkins, Abram S. Hewitt, D. G. Reid, William E. Dodge, H. H. Rogers, J. H. Reed, Percival Roberts, E. C. Converse, Clement A. Griscom, John D. Rockefeller, Jr.; Charles Steele, Norman B. Ream and Chairman Gary. Francis Lynde Stetson and J. P. Ord, of J. P. Morgan & Co., were also present, although not directors, while President Charles M. Schwab and Robert Bacon were among those absent, both being in Europe. One of the directors said in explanation of the length of the meeting that a number of routine matters had been considered.



STEEL YACHT FOR MR. VERNON C. SEAYER.

Navy Search Light.

A hand-controlled, 18-in. projector of the kind furnished by the Carlisle & Finch Co. of Cincinnati to some of the torpedo boat destroyers and cruisers of the navy is shown in the accompanying illustration.



Specifications of the navy require a much better projector than is necessary for ordinary commercial use. In the first place, no iron or steel is used in the construction, unless absolutely necessary, such as magnet cores, etc., where no other material would answer. The carbon-feeding mechanism must be capable of working in any position and of feeding the carbons the entire length without any apparent difference in the voltage across the arc. The cylinder or the barrel of the projector must be capable of rapid rotation by hand or gradual rotation by means of gearing. A vertical elevation of 70° above the horizontal and 30° below the horizontal is required. Added to these requirements, the entire projector must be constructed in the best possible manner and must be absolutely reliable in every part.

The projector shown is required to pick out a white object 10x20 ft. at a distance of 4,000 yards. Parabolic mirrors or Mangin mirrors may be used, and the projector is so constructed that either can be inserted in a few minutes. In case of an attack by torpedo boats the light would

be used at close range, and it is required to cover as great an area as possible. To do this, a special front cover is supplied, which is fitted with a set of dispersion lenses. These lenses spread the light out horizontally, but not vertically, so that the water is illuminated for a wide range. The mechanism for transmitting vertical motion to the cylinder consists of a worm and worm wheel, which may be thrown in or out of mesh like the back gear of a lathe. The trunnions for supporting the cylinder are adjustable.

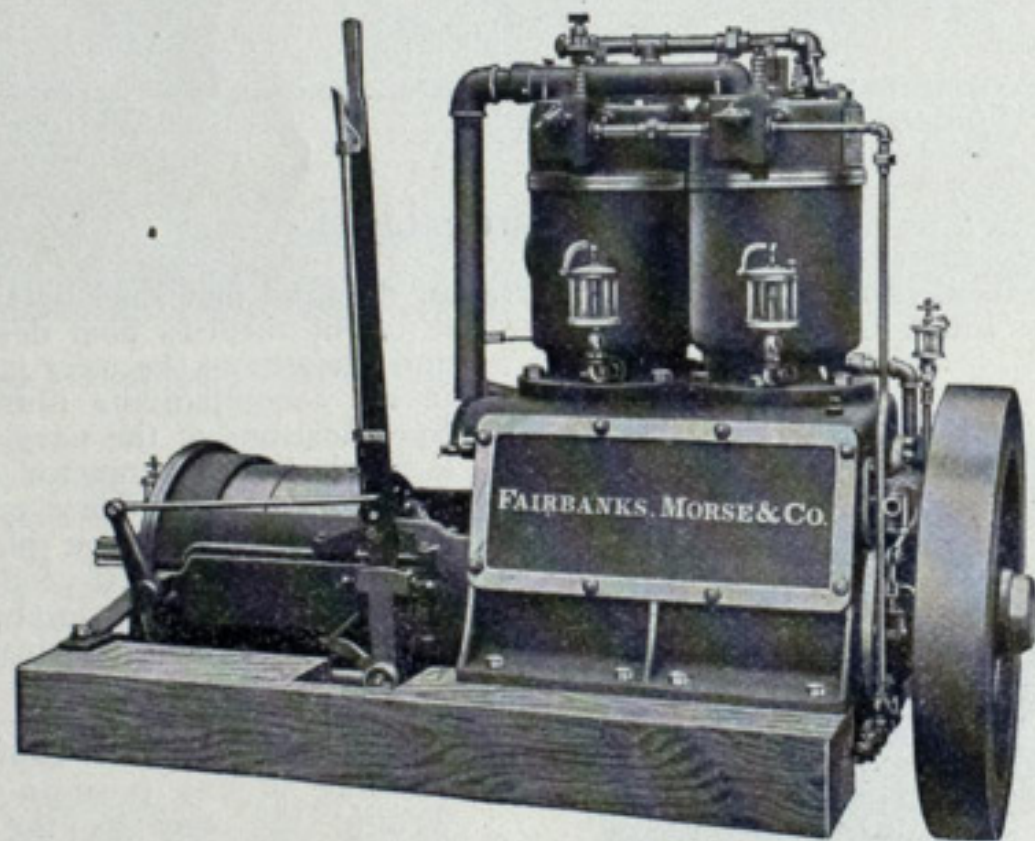
The Carlisle & Finch Co. makes search lights for all classes of sea, lake and river steamers.

Chicago Pneumatic Tool Co.

The organization of the Chicago Pneumatic Tool Co. of New Jersey, which involves consolidation of what were known as the Duntley companies, is completed. The new organization takes over the business and plants of the Chicago Pneumatic Tool Co. of Illinois, the Boyer Machine Co. of Detroit, the Chisholm & Moore Crane Co. of Cleveland, the Franklin Air Compressor Co. of Franklin, Pa., and the New Taite-Howard Pneumatic Tool Co., Ltd., of London, England. The securities issued are \$2,000,000 of 5 per cent. twenty-year gold bonds and \$5,000,000 of common stock, there being only one kind of stock. There remains in the treasury, unissued, \$500,000 of bonds and \$2,500,000 of stock.

Directors of the company are as follows: Charles M. Schwab, president United States Steel Corporation; John A. Lynch, National Bank of Republic, Chicago; John R. McGinley, capitalist and banker, Pittsburg; James H. Eckels, president Commercial National Bank, Chicago; Wm. B. Dickson, assistant to president, United States Steel Corporation; Charles A. Miller, president Galena Oil Co.; J. W. Duntley, president Chicago Pneumatic Tool Co.; Joseph Boyer, president Boyer Machine Co., Detroit; Edward Y. Moore, vice-president Chisholm & Moore Manufacturing Co., Cleveland; Max Pam, Counsel; John Charles Taite of Taite-Howard Co. of London, Eng.; Charles Parker Whitcombe of Taite-Howard Co. of London, Eng. The executive committee is made up of J. W. Duntley, chairman, Charles M. Schwab and Max Pam. Officers are: J. W. Duntley, president; W. O. Duntley, vice-president; Edward Y. Moore, second vice-president; Ernest P. Wenger, treasurer; H. R. Kent, assistant treasurer; LeRoy Beardsley, secretary; S. G. Allen, assistant secretary; Joseph Boyer, mechanical engineer; A. J. Doughty, general superintendent; Pam, Calhoun & Glennon, general counsel. The executive board has announced the following appointments: W. O. Duntley, vice-president and general manager; C. E. Walker, assistant general manager; Thomas Aldcorn, general sales agent; W. P. Pressinger, general manager air compressor department; Chas. Booth, manager Chicago office; S. G. Allen, manager New York office.

Fairbanks-Morse Gasoline Marine Engines



RELIABLE—COMPACT—ECONOMICAL
—FOUR-CYCLE. 20 to 100 H. P.

Built with 2, 3 and 4 cylinders. We furnish solid propeller with reversing mechanism. Early and late ignition. Self-starting pump. Speed controller.

FAIRBANKS, MORSE & CO.

CHICAGO	CLEVELAND	ST. PAUL	KANSAS CITY	LOS ANGELES
DETROIT	CINCINNATI	OMAHA	DENVER	SAN FRANCISCO
INDIANAPOLIS	LOUISVILLE	ST. LOUIS	SALT LAKE CITY	PORTLAND, ORE.
	MINNEAPOLIS		LONDON, ENG.	

"Seaboard Steel Castings."

MANUFACTURERS OF
"THE ADMIRAL" ANCHOR.

THE LATEST AND BEST
STOCKLESS ANCHOR.
APPROVED BY LLOYD'S.

ANCHORS CAST AND TESTED ON
ORDER, OR STOCK ORDERS
PROMPTLY FILLED.

A GUARANTEE OF QUALITY.

OPEN-HEARTH STEEL CASTINGS
OF THE HIGHEST GRADE.
FACILITIES FOR CASTINGS UP TO
80,000 POUNDS WEIGHT.

MACHINE WORK AND PATTERNS
FURNISHED WHEN REQUIRED.

RAIL OR WATER DELIVERIES.

CAPACITY, 1500 TONS PER MONTH

Seaboard Steel Casting Co.,
CHESTER, PA.

Kieley Expansion Steam Trap.

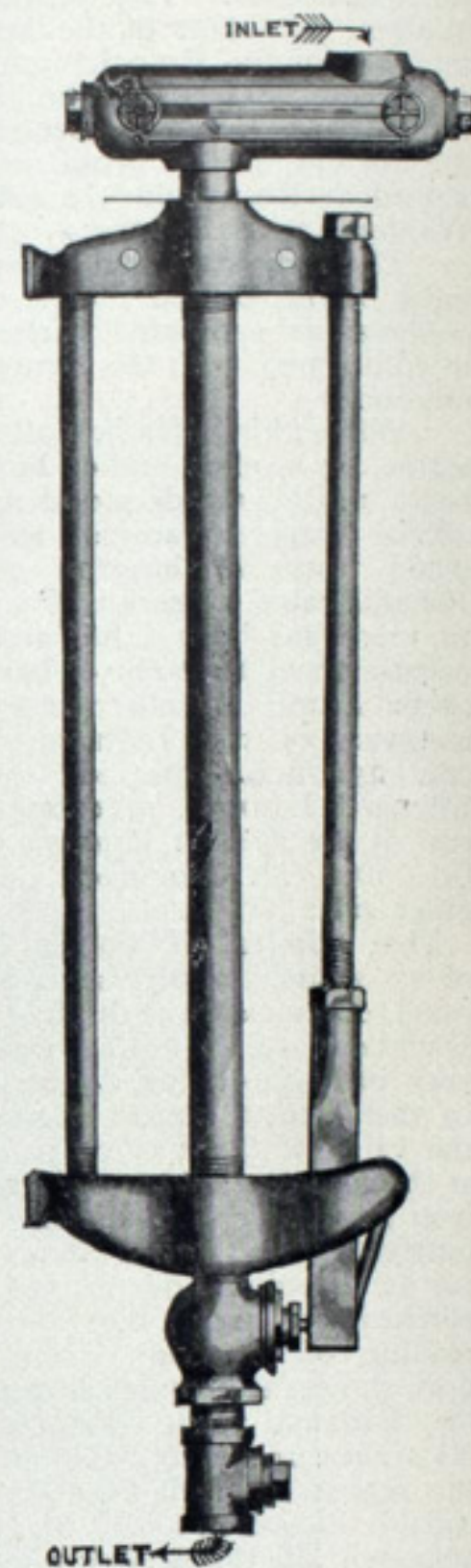
The Kieley cantilever expansion steam trap, manufactured by Kieley & Mueller, 7-17 West Thirteenth street, New York city, is shown in the accompanying illustration. The trap is very simple and is especially adapted to marine work, as it is of very light weight, but is nevertheless found satisfactory on the highest as well as the lowest pressures. It will discharge against pressure, and this is regarded as an advantage over most expansion traps. The expansion tube is made of heavy brass pipe; full area of valve is obtained. The trap will work in any position.

The trap can, of course, be made and set without the water column or strainer shown in the illustration. The strainer has a perforated copper basket in it to catch all the pipe scales, cuttings and other foreign matter. The construction of the strainer admits of the basket being taken out and cleaned by simply unscrewing the plug on top. The reservoir answers the purpose of a settling chamber as well as a condenser, whereby the smaller particles of dirt are prevented from getting under the disc of the valve and the capacity of the trap greatly increased. The reservoir can be fitted with a glass gauge to show that the trap discharges the water as fast as it comes along.

These traps are adjusted before they leave the works, but if for any reason they require readjusting, all that is necessary is to screw the hexagon head on top of rod to the right to cause the trap to close earlier, and to the left to cause it to close later. There is an ordinary tee fitting and plug connected to the outlet end of the trap. To learn whether the trap is working properly or not, it is only necessary to take out the plug.

The manufacturers say that this trap gives excellent results on the cylinders in paper mills, evaporating pans, brewers' kettles, paper dryers, etc.; in fact on any steam apparatus from which the condensation is to be drained. The traps are also well adapted to car heating, as they are both sensitive and positive in action, and cannot freeze or become air-bound.

Kieley & Mueller are also manufacturers of reducing and back pressure valves, relief valves, pump governors, damper regulators, standard traps, grease extractors, steam separators, steam return traps, etc.



STEEL PROPELLER WHEELS.

It is safe to say that the year 1901 will show a larger number of steel propeller wheels having been made up than the total for any two previous years, the Marine Iron Works (Station A, Chicago) alone having more than doubled any previous year's sales on these steel wheels, with three months yet to hear from. The composition being an open hearth homogeneous steel, is exceedingly tough and ductile. The sizes range from 30 in. diameter up to 5 ft. The higher first cost when compared with the cast iron wheels is very quickly earned, especially where boats are operating at times on somewhat shallow water.

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